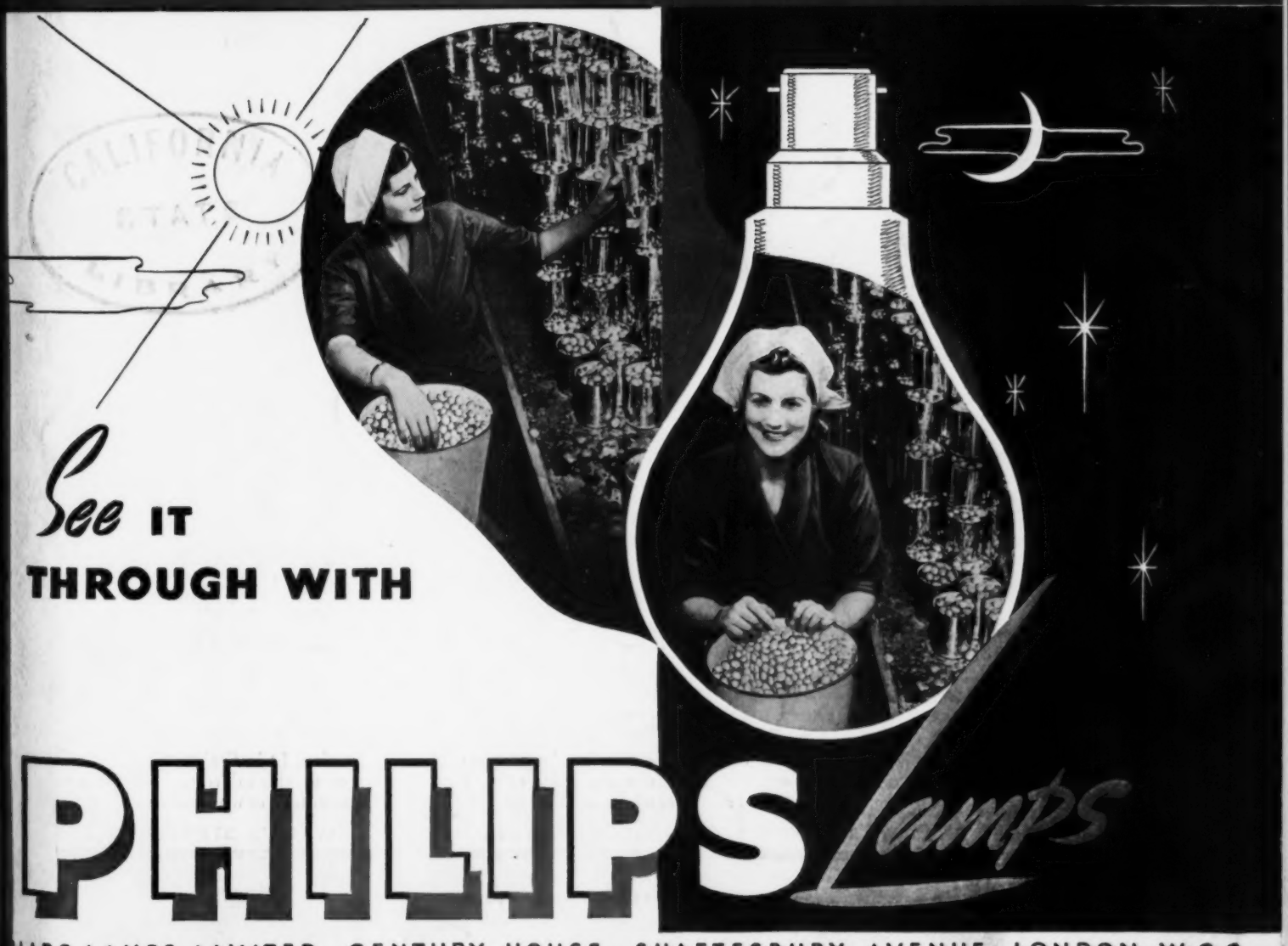
FOOD MANUFACTURE

RS: LEONARD HILL LIMITED, 17, STRATFORD PLACE, LONDON, W.1 FEBRUARY 1, 1942



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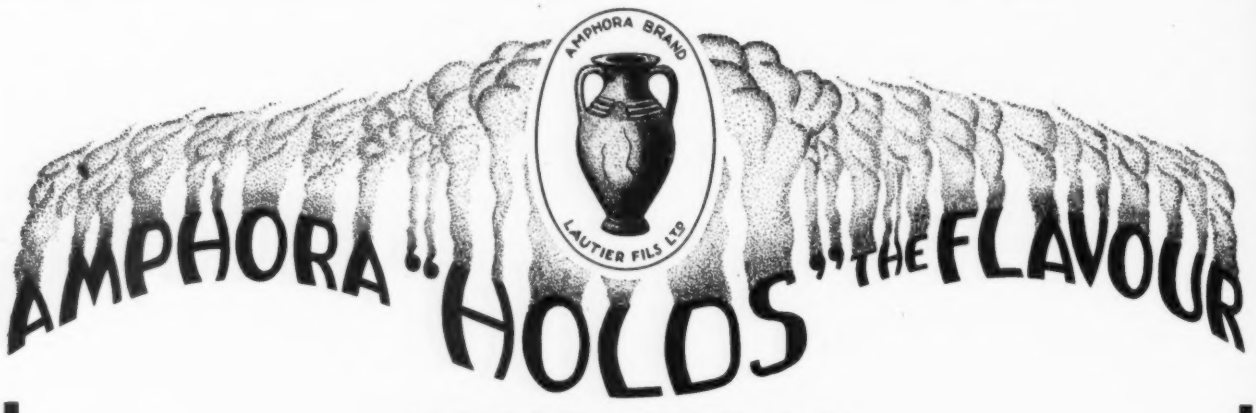

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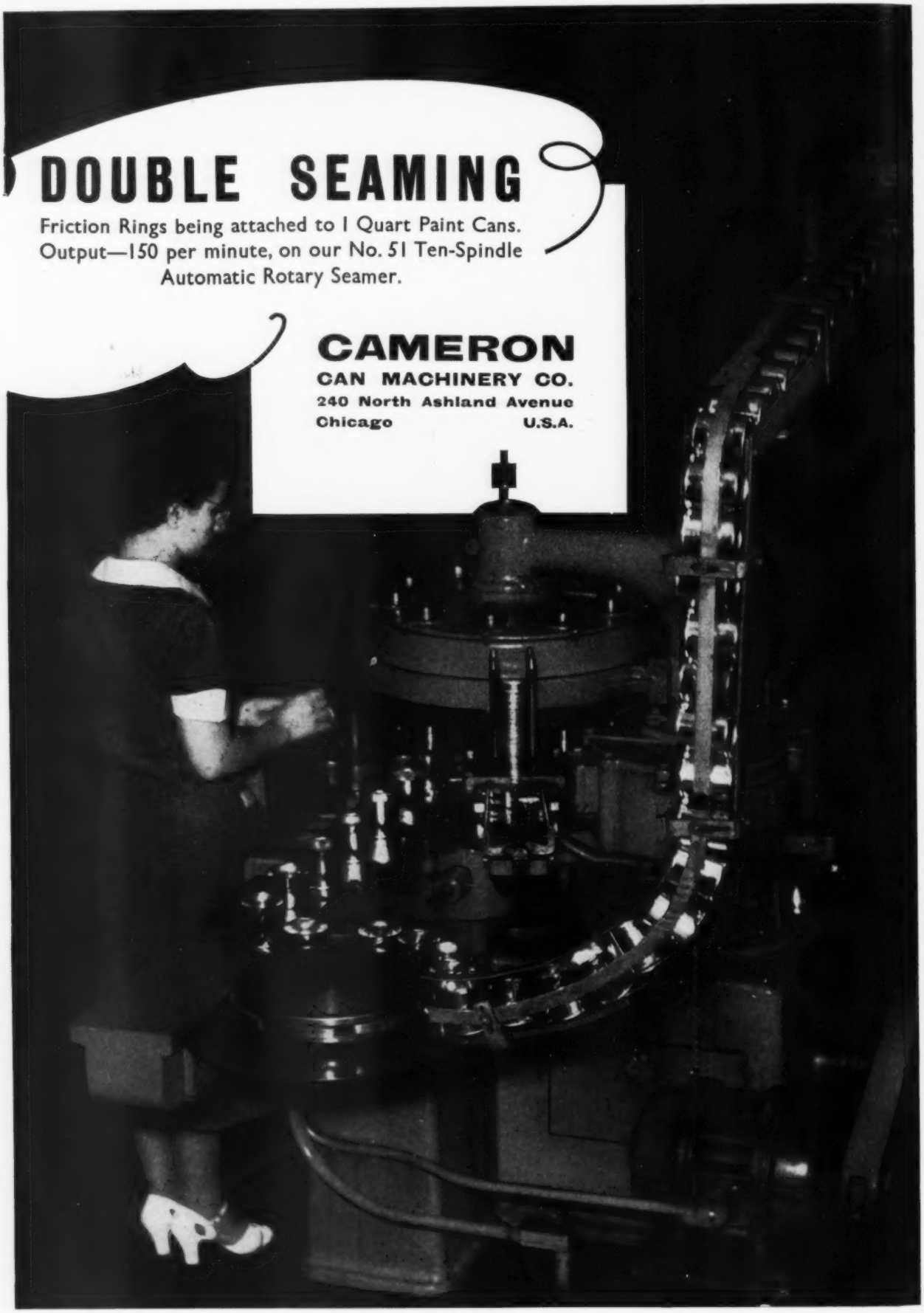
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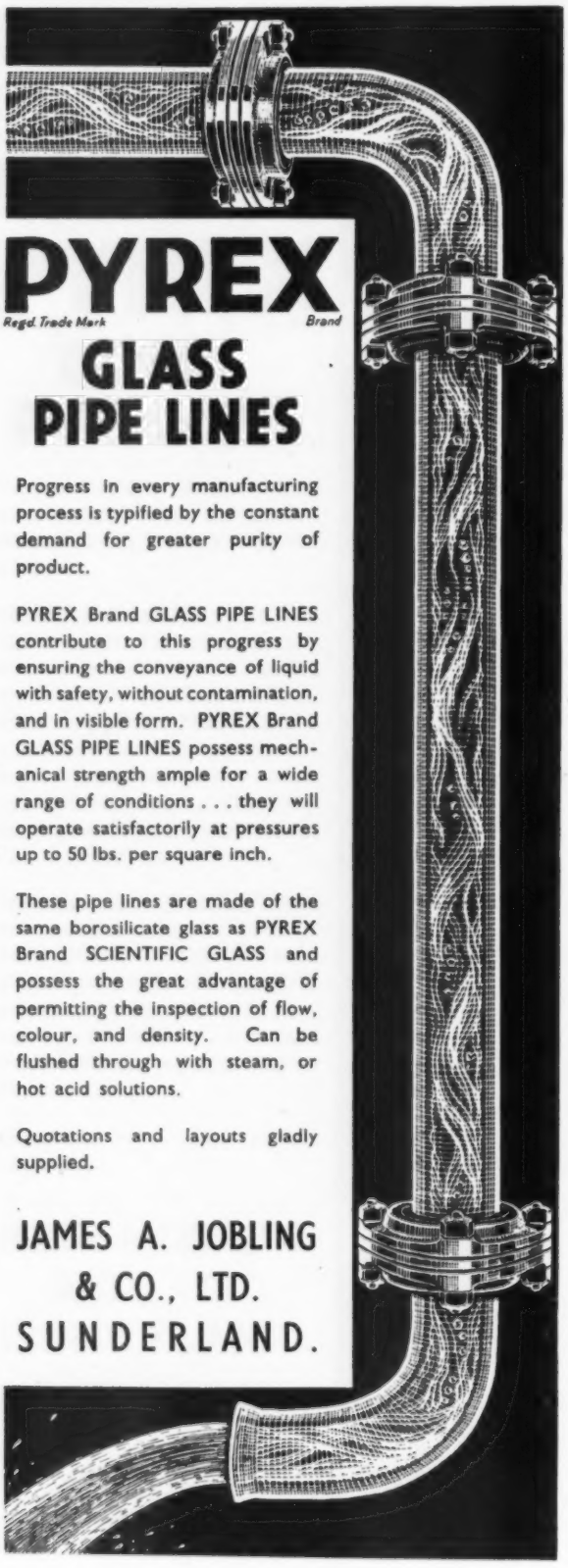

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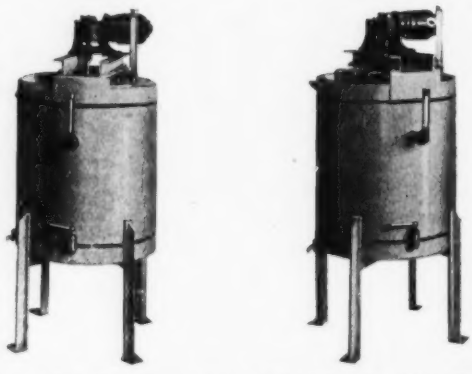

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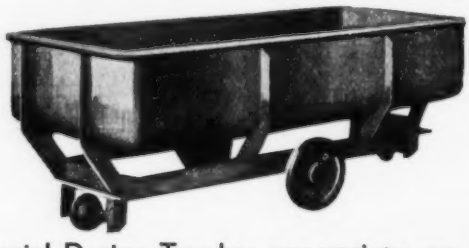

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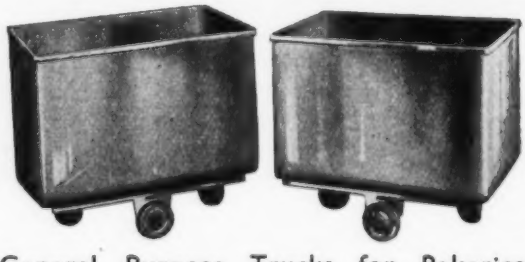

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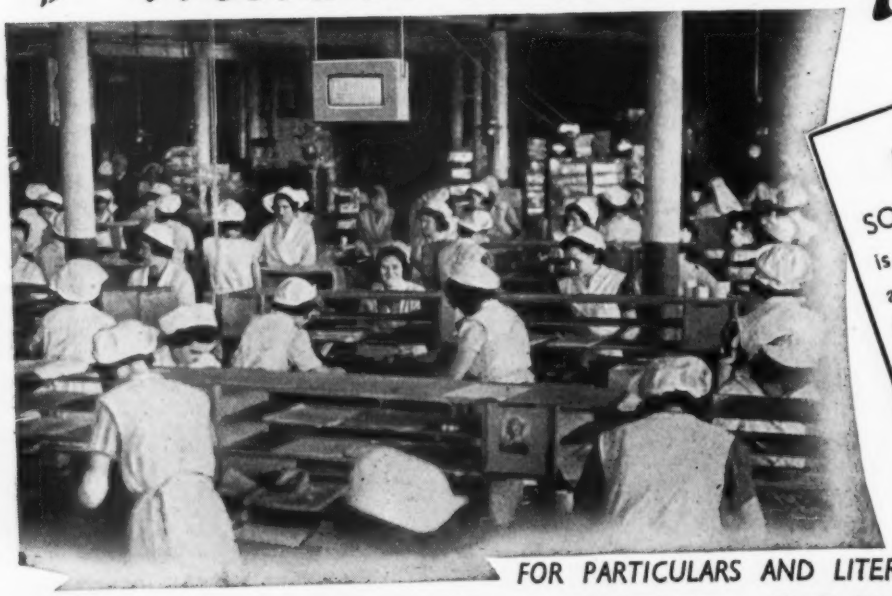

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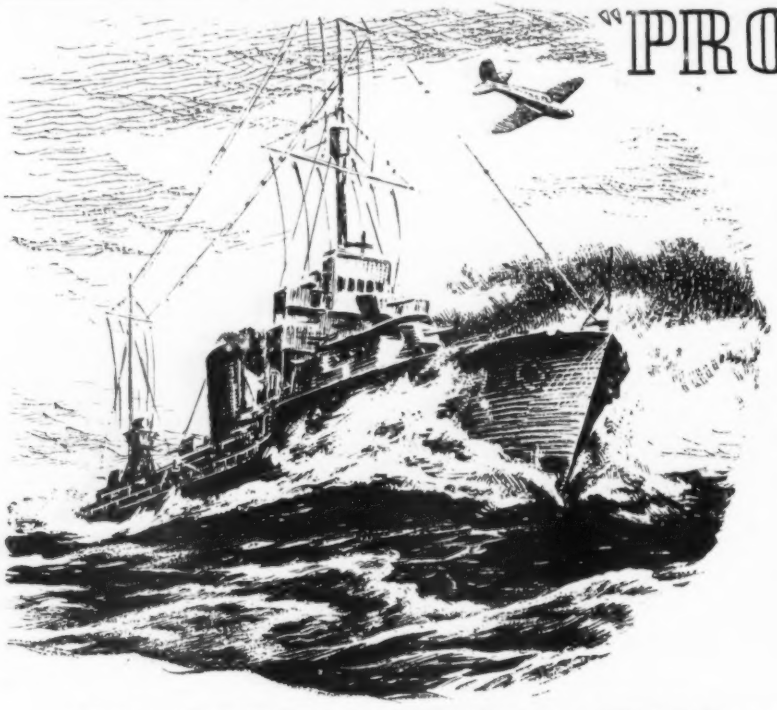

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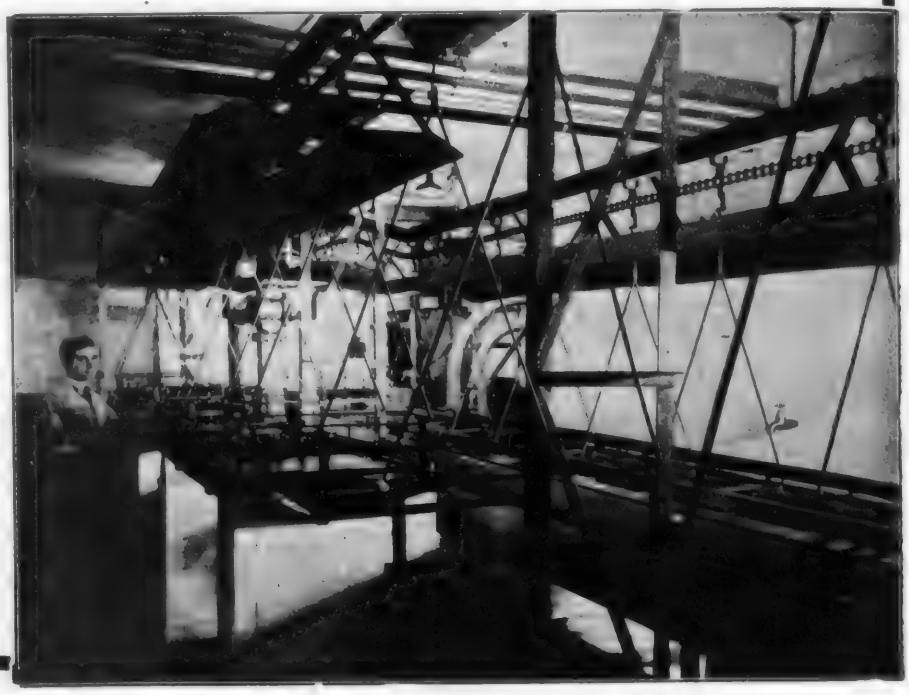

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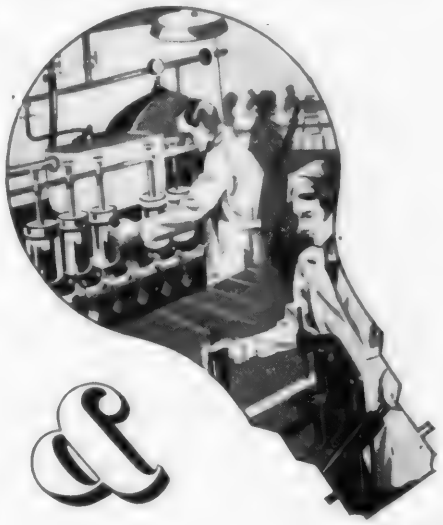

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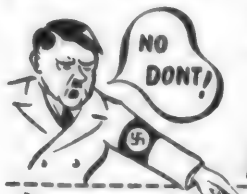

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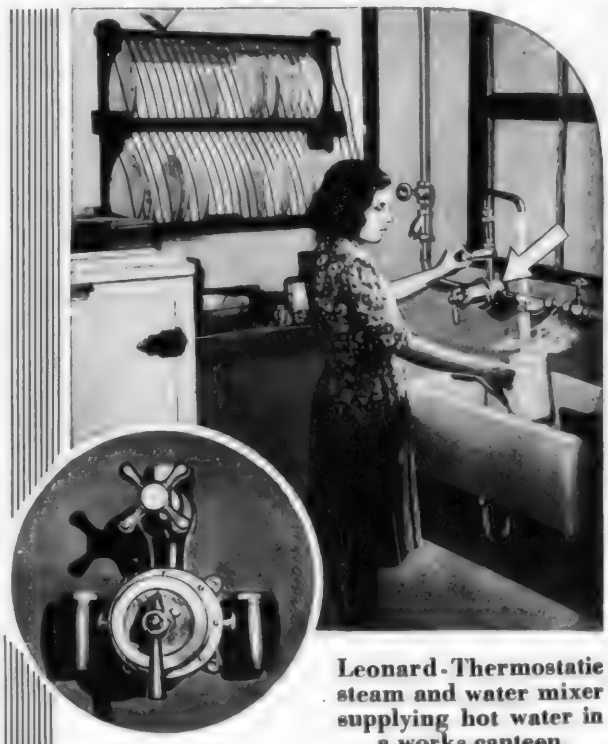

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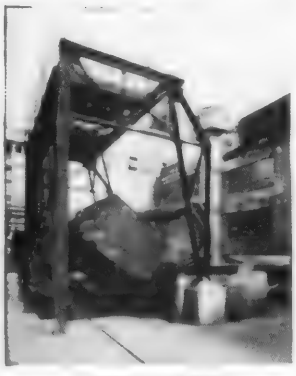

Wagon partly lifted.

Tipping completed.

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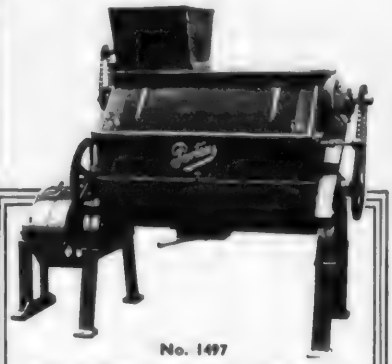
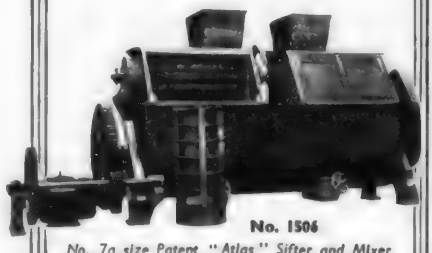


No. 1497

Size 4 Machine with gear and chain cases removed—can be supplied belt driven or direct motor driven.



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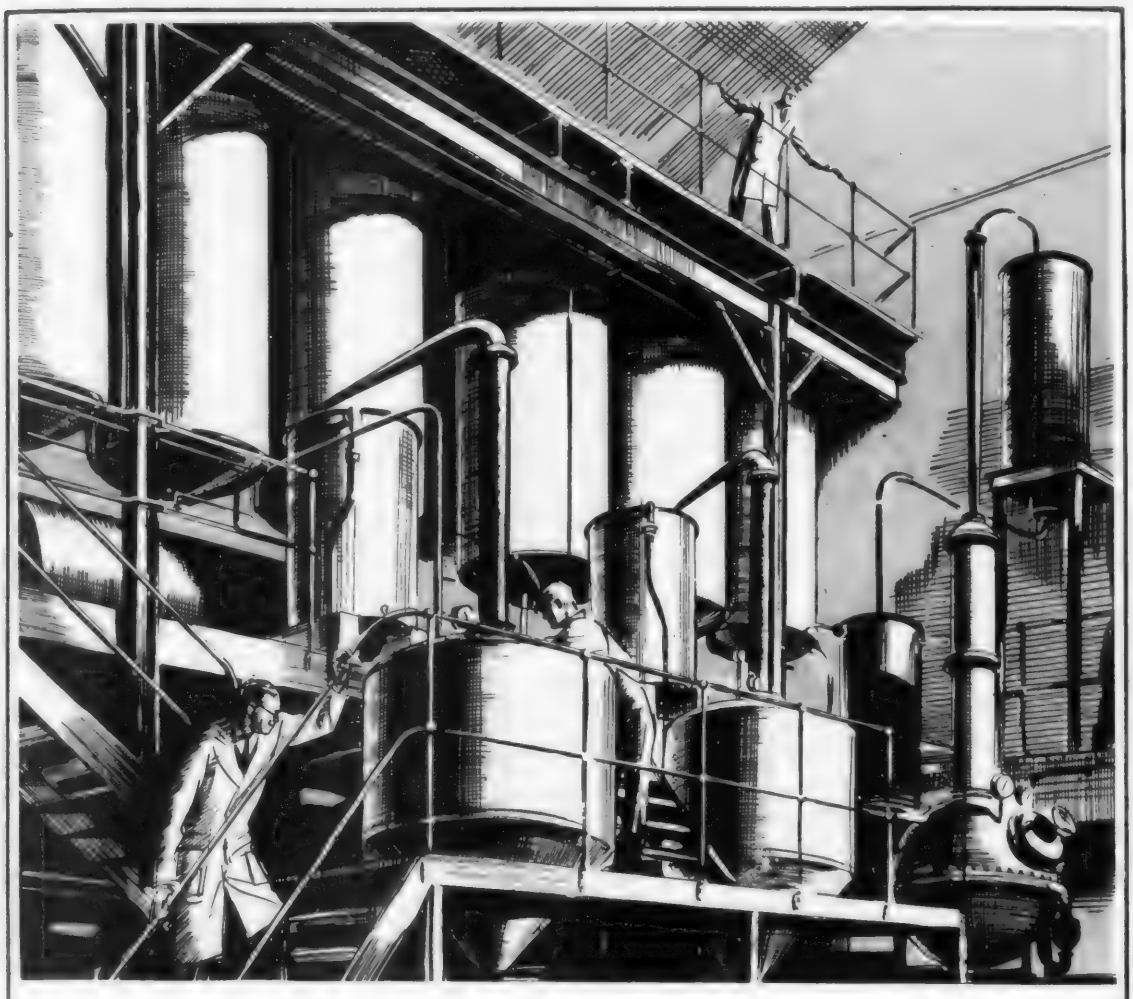

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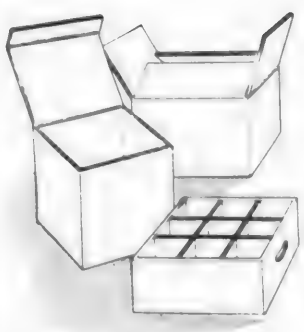

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Address .....

Date of appointment ..... *Time* .....

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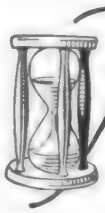
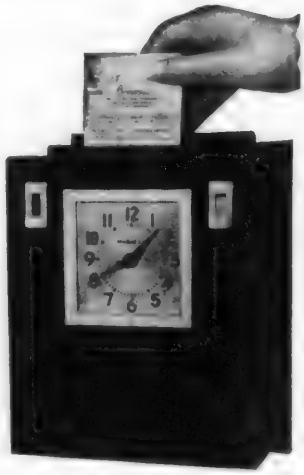


Time..... still on it creeps, each little moment at another's heels till hours, days, years and ages are made up of such small parts as these. Men look back worn and bewildered, wondering what it is, for it travels like a ship in the wide ocean that has no bounding shore to mark its progress.

Johanna Baillie.



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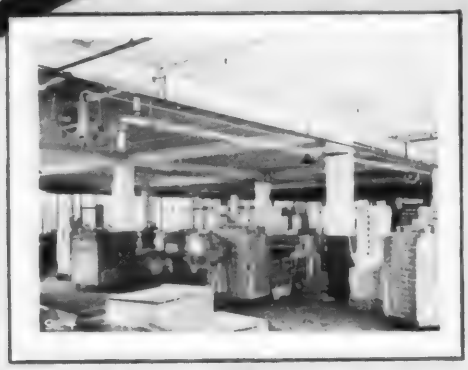

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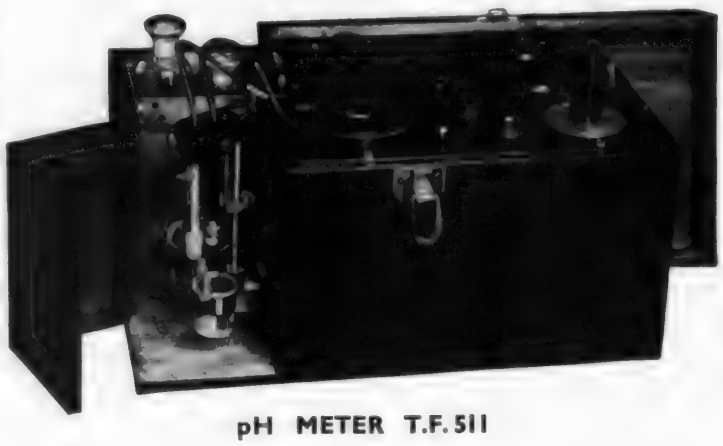

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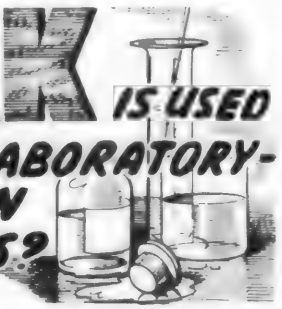

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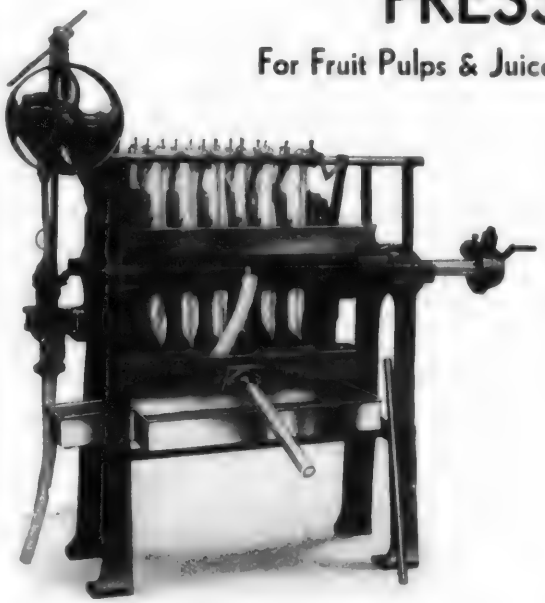

The pulp is first squeezed in bags hung between the plates, and distance frames are then inserted in the machine for the subsequent filtration of the expressed juice. The apparatus is, therefore, ideal for the small manufacturer, as the necessity for separate machines for pulp and juice filtration is obviated.

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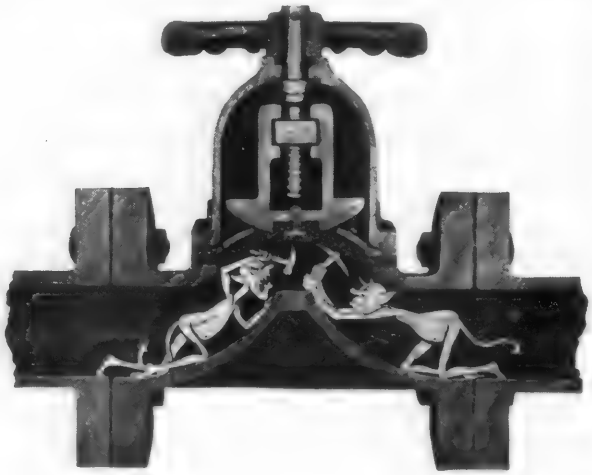

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Cautionary Tales No. 4

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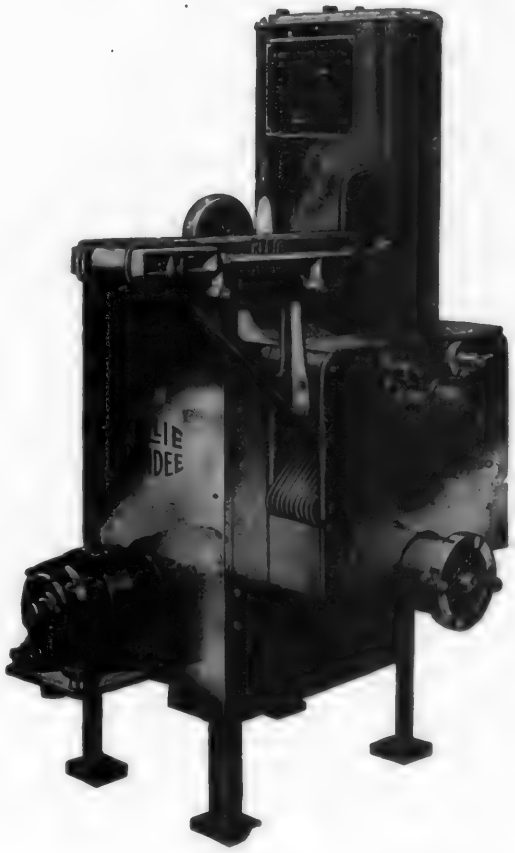

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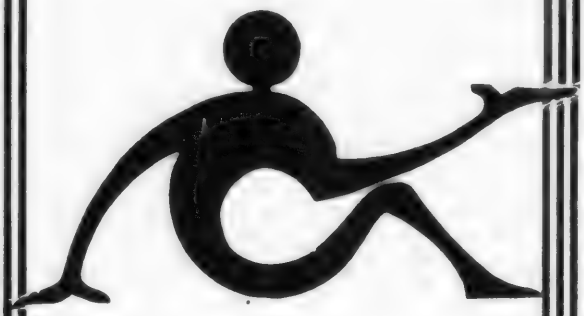

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FOOD MANUFACTURE

VOLUME XVII. No. 2 FEBRUARY 1, 1942

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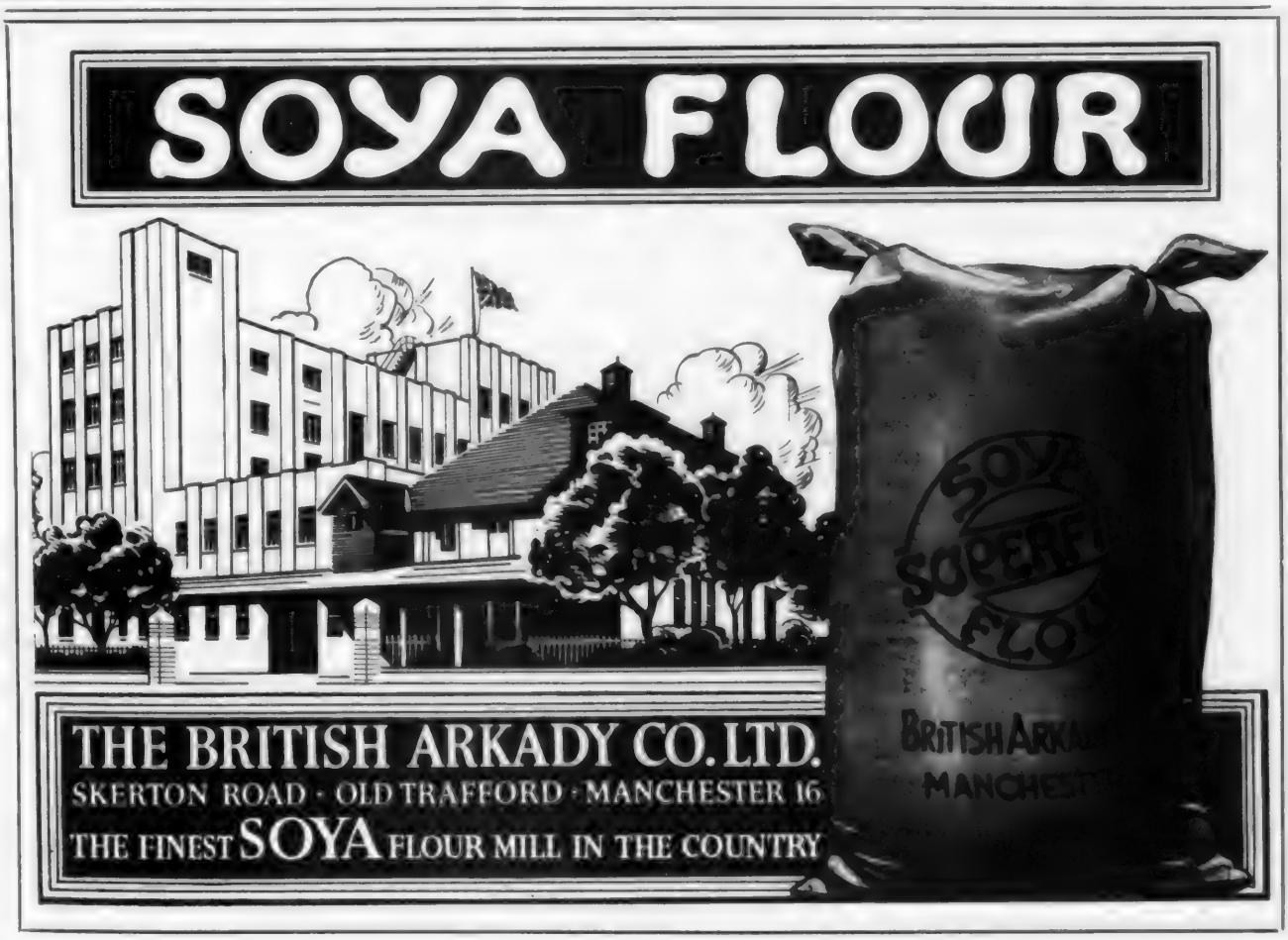
The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.



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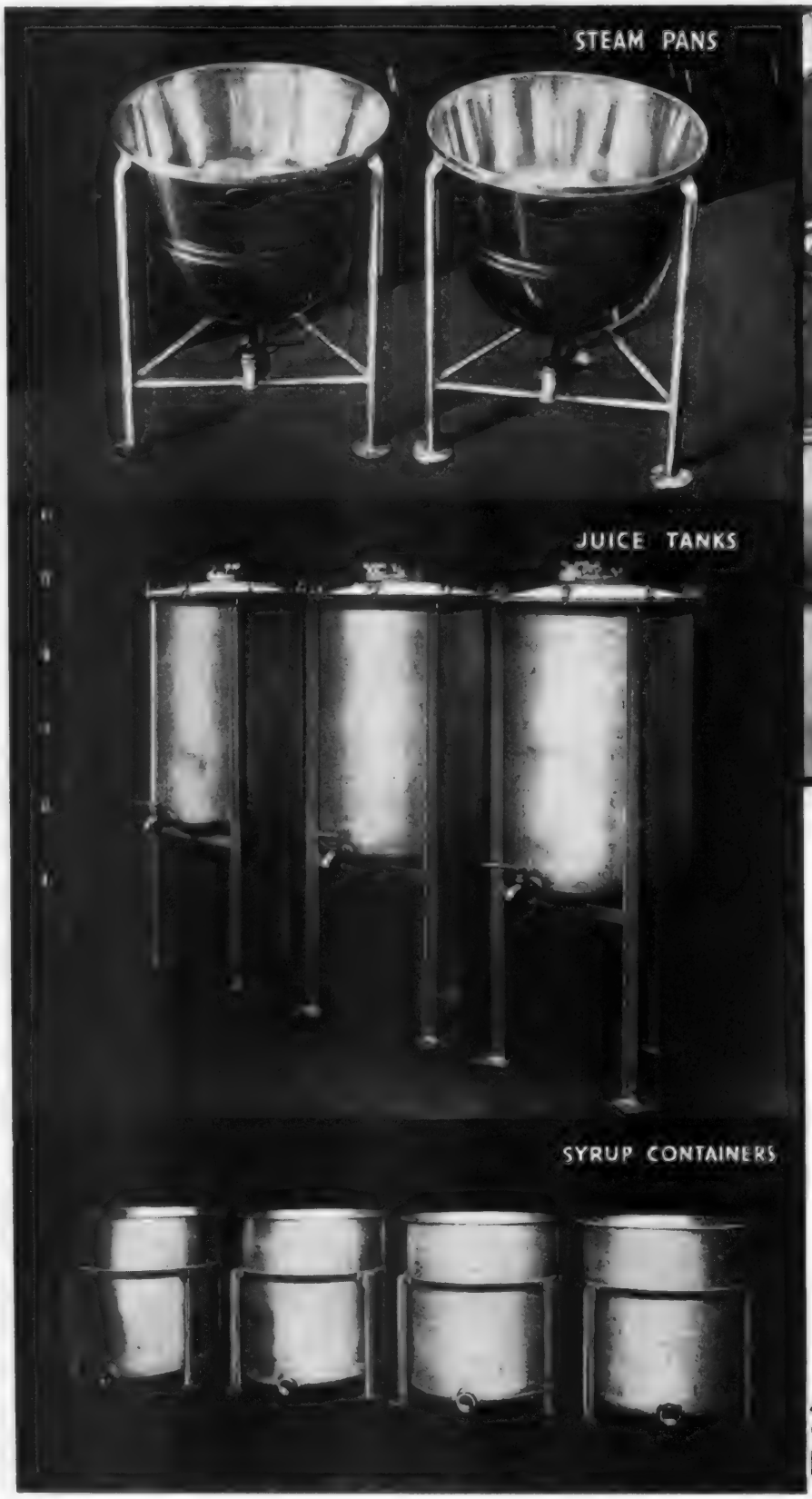

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Facing first page of Editorial

FOOD MANUFACTURE

Vol. XVII, No. 2 February 1, 1942

The Technology of Pineapple Canning

AMIDST ALL its war-time menaces and preoccupations, French Indo-China has found time to prepare a beautifully produced book of nearly 200 large pages entitled *La Technologie de l'Ananas: fabrication des conserves et des jus; applications indochinoises*, written by T. Tkatchenka and published in 1941 at Hanoi by the *Gouvernement Général*. It may be mentioned incidentally that the author's unusual name is of Ukrainian origin. To stay-at-home Britons the book may have little more than a nostalgic interest associated with mouth-watering vanished delights, but to those who have any practical interest in the preparation of products from fresh pineapples the book will prove a mine of information.

The book does not consider any agricultural aspect, but, starting with the fully grown fruit in the field, as it were, it minutely considers every technical process in the canning of juice and fruits. It lays bare every secret, from sealing compounds to the composition of the syrup for fruits of different quality; regarding juice, it explains exactly why the Hawaiian product is so uniform and superior, and in what details the Indo-Chinese producers fail to match the standard thus set. After reading the book one feels that there is nothing to prevent one from sailing in and producing the very finest qualities of slices and juice—providing, of course, that one can get the fruit. Commercial aspects of production, trade and legislation are considered, and there are very numerous graphs, working sketches and photographs of machines, etc.; in short, the book is one of the most complete expositions of an industry that we have seen. From the canning point of view it should be useful to many processors who do not deal with pineapples, as it seems likely that they will be able to obtain a number of hints likely to be useful in the control of manufacture of any canned product.

Canned Foods Advisory Bureau

Initiated in 1937, this bureau has for its aim the dissemination of information on the nature and use of canned foods.

The bureau has recently produced "an extremely useful little booklet containing a guide to and description of the canned goods available to all through the 'points' rationing scheme". The public has been invited by means of advertisements in the national dailies, London evening and Sunday papers to apply for the booklet, which is supplied free of charge.

A complete list of the canned foods available is given, and valuable hints supplied regarding the formation of an emergency store, with information on inspection of the tins, length of time of keeping, etc. A number of recipes for the preparation of the products in attractive form are included.

Not a trading organisation, the bureau has done excellent work since its inception in familiarising the public with the possibilities of canned foods and of their reliability. That propaganda is still not unnecessary is demonstrated by the persistent trickle of adverse opinion appearing in the Press, attacking canned foods from different angles.

Food Substitutes

The spate of prosecutions connected with food substitutes must be a matter for disquiet on the part of the majority of food manufacturers in this country. We say "majority" because there can be no manner of doubt as to the probity of the industry as a whole. With the exception of a few established firms who in some way or another have fallen foul of the regulations, whether by misapprehension or other causes, the fraudulent substitute traffic is of mushroom growth, exploited by irresponsible newcomers with little or no reputation to lose.

The Liverpool grocers have recently followed the example of those of Leeds in deciding to sell no more substitutes as a protest against the prosecution risks to which they feel themselves unfairly exposed. The retailers' contention is that they should be able to sell without risk any food substitute for which the manufacturer has been licensed by the Ministry of Food.

The Food Substitutes Control Order is unfortunate since it expressly states that "a licence granted under this Order shall not operate to relieve the holder thereof from complying with the provisions of any Act, by-law, regulation or Order for the time being in force". It is stated that the Ministry's licences are granted as the result of the disclosure of the composition of the substitute to the Ministry and a discussion concerning labels, advertisements and price at which the product is to be sold. There does not appear, however, to be any machinery by which an efficient check can be made on those manufacturers who fail to keep their agreements, on the one hand, or by which the analyst working for an authority can be satisfied that a product has been licensed and is being manufactured according to the licence, on the other. In many countries it is necessary to disclose the composition of all medicines and in some it is essential to label foods with their composition. In the case of substitutes there would appear to be no sound reason why some means could not be found by which Public Analysts and others in similar positions would be automatically informed of all licensed products and their composition. Such a procedure would enable an efficient check to be made all over the country to see that manufacturers were keeping to their half of the bargain and would at the same time prevent action being taken against them, when they are in fact doing so, but when an individual analyst may not be of one mind with the Ministry of Food. The present time would appear to be an excellent one for the setting up of a tribunal before which discussions regarding the composition of foods and substitutes could be argued. The prosecutions in connection with some of these substitutes have brought to light some anomalies in the present situation. A substitute has been found to be faulty by one analyst; word has been passed around and a particular substitute has been condemned numbers of times with numerous prosecutions for the same offence. In some cases it has been argued, however, that later prosecutions are subsequent offences and the manufacturer has been mulcted accordingly. But other instances have shown that manufacturers have made enormous profits and left the retailers or middlemen to hold the baby, and the fines which can be imposed are, as magistrates have remarked, hopelessly inadequate to affect that type of person.

Commercial Carotene

Carotene, used for addition to animal feeds to increase their vitamin A potency, is readily obtainable in crystalline or amorphous form or dissolved in oil in commercial quantities. These preparations are also used to provide standards for vitamin A estimation and for the standardisation of photoelectric or visual colorimeters intended for the determination of carotene. For all these purposes the purity of the carotene is of the utmost importance, and this is, of course, influenced by the stability of the product. Several workers have studied the stability of carotene solutions in oil, but only a little work has been done on the stability and purity of the solid material. This gap has now been filled by the work of G. S. Fraps and A. R. Kemmerer (*Ind. Eng. Chem. News Edit.*, 1941, **19**, 846), who find that solid commercial carotene, supplied by the makers in sealed tubes, may contain from 5 to 15 per cent. of colourless impurities. The coloured material may contain about 13 per cent. of α-carotene and 33 per cent. of β-carotene, the remaining 1 to 4 per cent. being coloured impurities. When exposed to air at room temperature as much as 63 per cent. of the coloured material may be lost by rapid deterioration, and even in a refrigerator 45 per cent. may be lost in one week, while as much as 29 per cent. of coloured impurities may be formed at room temperature during the course of a month. For some at present unknown reason some samples of carotene show but little deterioration. To purify the carotene which has deteriorated these workers recommend dissolving it in chloroform and precipitating the colourless impurities with methanol. With both poor and good quality carotene this treatment reduces the colourless impurities considerably or to 0-1 per cent. respectively, while the coloured impurities are reduced to 1·35-5·3 per cent. and 0·3-3·3 per cent. respectively. It was not found possible sufficiently to purify carotene of poor quality, exposed to air for several weeks, by this method to allow of the use of the purified material as a quantitative standard.

The Sand Plum

The sand or beach plum, *Prunus maritima* Wang., is an extremely hardy native of the Eastern United States, where interest is being fostered in its economic possibilities by the institution of two prizes for work in connection with it—the James R. Jewett prize, awarded by the Arnold Arboretum of Harvard University, and the Vieno T. Johnson prize. Both have recently been awarded for the first time. Mrs. Wilfred O. White, of Boston and Vineyard Haven, Mass., the winner of the first of these prizes, has carried out useful experimental work on material planted on a five-acre tract of land, while Mrs. Ina Snow, of Truro, Mass., has also accomplished experimental field work and has stimulated interest in the plant by the publication of various articles dealing with it, detailing her observations concerning its growth and fruiting habits.

As the plant is hardy in this country, it might be worth while devoting some attention to it here, where so far it appears to be known only as a free-flowering garden shrub. The importance of the shrub arises from the fact that it thrives on sandy soils which will support very little other vegetation of any economic value. The fruits should be found useful for making conserves and jams, and no doubt could be improved by careful cultivation. There is considerable variation in the colours of the wild fruits, so that the development of several distinct forms seems possible. Of special interest is the form (*forma flava*) with bright yellow fruits, which are said to resemble apricots in flavour and to be more acceptable for eating raw than the fruits of other varieties, though even in the case of purple fruits considerable variation in flavour has been noted.

The Place of Protein in the Diet

In his second lecture at the Royal Institution Professor J. C. Drummond discussed the question of protein requirements in war-time dietary. There was a lack of information, he said, in the literature on the amount of protein which should be provided per head of population. With regard to growing children and expectant and nursing mothers the position was established, although there was little information as to exact physiological requirements. But the data upon which estimates for the general population might have been founded contained nothing but calculations of what people normally ate.

The adult required a very small amount of protein to replace wear and tear. The protein intake in normal times, as shown by Orr's dietary surveys, extended from 68 to 100 grams per day according to income level. In the higher income groups this protein was divided up into 40 grams from plants and 60 grams from animals, the latter proportion becoming less as incomes diminished. These values were double or more the amount required to replace wear and tear.

The lecturer also suggested that, in assessing the importance of protein, the psychological aspect must not be ignored. Its purely physiological importance was greatly overrated, particularly with regard to the amount needed by the manual worker. In many parts of the world the coolie carried out hard physical labour without animal protein or very little of it. But so deeply was the fallacy as to the need for meat rooted in the community that it was better to give way to it, as the German Government had done, by allowing extra meat for those engaged in hard manual work.

Professor Drummond mentioned that, in comparison with 1935, a survey of the diet of middle-class families in 1941 showed that the total protein had dropped from 67·3 to 64 grams and the animal protein from 46 to 33·8 grams. This did not have the slightest effect on health, although it was getting down to a level at which there might be some concern as to the care of the child. However, the animal protein intake was getting back to pre-war level by means of cheese consumption.

National Bread

Professor Drummond pointed out that bread was a good and cheap protein food, though without the nutritional value of meat, milk and eggs. For a shilling it was possible to buy 215 grams of protein in the form of bread as compared with about half that amount in the form of potatoes and very much less in the form of meat.

He mentioned that the Ministry of Food was continually asked why it did not insist on bread from the whole wheat, and stressed its indigestibility. It was largely on digestibility trials that it was decided to adopt an 85 per cent. flour. The Ministry was also asked why 85 per cent. bread should not be made compulsory, and this would be done if the shipping position necessitated it.

The country had not been converted to this type of bread, the obstacles being public indifference and conservatism.

With regard to the fortification of the white loaf, Professor Drummond said that of course this could be done and was being widely done in the United States, where not only vitamin B_1, but riboflavin, calcium, iron and nicotinic acid were being added to bring up white flour approximately to wheatmeal while retaining its whiteness. But there was always a feeling with a fortification policy that not all the elements, or all in the right proportion, might be added and that it was much better, if possible, to allow them to be distributed naturally in the different foods.

Fortified White and Wholemeal Bread

Described in *Milling* as "a murderous broadside into the brown flour 'school', already floundering from previous onslaughts", is a paper by Dr. Margaret Wright, published in the *British Medical Journal*, November 15, 1941. This paper criticises the conclusions arrived at by Dr. Harriette Chick (*Lancet*, 1940), in comparing the nutritive values of wholemeal and fortified white flours.

Dr. Chick stated that the nutritive value of straight-run white flour (73 per cent. extraction), tested on young, growing rats, has been found inferior to that of wholemeal flour, even when the defects of the former in protein, minerals and vitamin B_1 have been corrected. The inferiority must be attributed to lack of B_2 vitamins. Dr. Wright challenges this conclusion, giving data regarding another series of experiments. Lack of space precludes the possibility of recording the arguments, but very briefly Dr. Wright's case is that Miss Chick's rats ate less white bread by reason of its lesser palatability and so obtained less protein. That the rats receiving the white flour diet received less vitamin B_1 than those on the wholemeal diet. That the rats receiving white flour diet received less vitamin E than those on the wholemeal, which contains the germ. And, finally, that the number of animals experimented on was too small to enable satisfactory conclusions to be drawn.

Dr. Harriette Chick replied to Dr. Wright's criticisms in the *British Medical Journal*, November 29, 1941, and incidentally points out an error in Dr. Wright's account of her (Dr. Chick's) work—the statement that her comparison was made between "straight-run flour (73 per cent. extraction) and wholemeal (82 per cent. extraction)". The "wholemeal" flour used by Dr. Chick contained, as the term signifies, 100 per cent. of the grain. The white-versus-brown-bread controversy is still full of life.

Reliability of Organoleptic Tests

A stimulating article by John W. Crist and H. L. Seaton of the Michigan State College of Agriculture and Applied Science on this subject was published recently in *Food Research*, 6, 5, 1941. The search for technical criteria to determine final quality in preserved foodstuffs has had little success, say the writers.

We ourselves have been present at a multitude of "tastings" by experienced executives, and this experience has led us to the conclusion that the "tasting-panel" method is about as unreliable as anything could be. In judging six samples of canned meat, for example, six tasters will disagree upon such items as saltness, toughness, sweetness, subsidiary flavours and any other property. In placing samples in order of quality, it will be certain that one member of the panel will place best the sample which another member will pronounce the worst.

The authors agree with what they call a sort of proverb in the American trade which says, "The people buy with their eyes", and dryly suggest that although this way of doing it may not be entirely consistent with respect to quality as regards taste and colour, it is consistent from the standpoint of ability to form similar judgments in successive trials and selections. But they do not stop there. They look forward to the discovery of some all-inclusive and authentic technical method or sets of methods, for the determination of quality in packed fruits and vegetables. While waiting for this, they suggest three alternatives for immediate procedure. Space does not permit of giving their suggestions *in extenso*, but, briefly, the first is to professionalise the business of tasting foodstuffs. They cite wine and tea tasters, but are sceptical as to their actual efficiency, and suggest that their reputation has merely, or at least mainly, only traditional authenticity.

The second alternative is to replace "tasting panels" with "looking panels". This would conform with the buying public's way for selection of its edible products but would mean reliance on the proposition that an actual correlation between appearance and taste does exist!

The third alternative is "the devising of some type of experimental circumstance which will facilitate a more accurate and consistent exercise of the sense of taste, either alone or jointly with vision and smell, in ordinary operators". This is being examined by the authors, but they say that hope for success is not especially bright. "To expect," they say, "a degree of experimental refinement and adaptation that can measureably and quickly confer acuteness upon inherently dull human senses is probably too great an expectation."

And so we leave the subject for the time being, with the hope that the authors' further experiments will not have so dismal a result as they anticipate.

Cannibalism and Diet

Morality, it has been said, is largely a matter of geography. Cannibalistic tendencies in birds seem to be less influenced by geography than by diet. G. E. Bearse, V. L. Miller and C. F. McClary have been trying for some time to determine what fraction of the husks of oats was effective in preventing or retarding the onset of cannibalistic tendencies in intensively reared chickens. In an issue of *Poultry Science* they announce that a fraction of oat husks that was obtained by dilute acid digestion effectively controlled cannibalism and also improved the development of feathers. The acid extract and the ash of the husks were not similarly effective, so the nutritional deficiency that expresses itself in cannibalism is not related to minerals. Manufacturers of oat husks will be able to revise a proverb and re-word a slogan: "You want fine feathers; we can supply them."

On the other hand, ordinary salt was curative of cannibalism in quail in captivity, according to R. B. Nestler in *Modern Game Breeding*. Toe-pecking in mature quail was stopped within twenty-four hours by increasing the salt content of the diet to 2 or 3 per cent., and fighting was checked by raising the salt content to 5 or 6 per cent. and maintaining it at that level for several days. Would that all our problems were solvable as easily!

The Viscosity of Chocolate

An interesting paper by J. Stanley (*Ind. Eng. Chem.* [*Anal. Edit.*]) deals with the theory and technique of the MacMichael viscometer applied to the determination of the viscosity of chocolate. No single set of MacMichael conditions will accurately cover the entire range of chocolate viscosities, but Stanley elaborates a modified Couette equation, which holds dimensionally for the MacMichael instrument. From practical, commercial and logical reasons this worker considers it preferable to express the results in degrees MacMichael instead of terms of absolute viscosity. The influence of temperature when preparing the sample for test is shown to be important; and agitation, particularly in the absence of lecithin, will reduce the viscosity of some chocolates.

The fineness, cocoa butter, lecithin, moisture and inclusion of air all affect the viscosity and allow important conclusions to be drawn from the results. Stanley shows that, besides saving cocoa butter, counteracting moisture and stabilising the chocolate, the inclusion of lecithin gives protection to the colloidal dispersion, especially when the chocolate is in the molten, heated or overheated state.

A study of the rheological properties shows that a numerical measure of "gumminess" is given by the "yield stress" while the "coverage" of chocolate is represented numerically by the "body". The rheograms of chocolate will show when an imperfect emulsion has been formed, such poor emulsions often breaking down on transport.

FISH CANNING IN AUSTRALIA

This abstract from a paper by E. L. FERGUSON WOOD, M.Sc., B.A., A.A.C.I., an Officer of the Division of Fisheries, Council for Scientific and Industrial Research, relates to Australian fish canning, but the experiments and conclusions should be of interest and value to fish canners in general.

THE primary object of the experiments recorded has been to discover what Australian fish produce a palatable canned product and what is the best method of treating them. Primarily it was intended to study only the most prolific fish, but latterly the investigation has been extended to estuarine fish which might profitably be canned, especially in war-time, by small canneries run on co-operative lines. Such canneries would operate with about a dozen hands, and would require a small boiler of about 10 h.p., a semi-automatic seamer, two small retorts, a simple exhaust box, and possibly a labelling machine, the whole cost of the plant being in the vicinity of £1,000.

Classification of Fish from Canning Standpoint

The following is a classification of the more abundant fishes as regards flavour when canned:

Tuna.—A first-grade product for the discerning palate. This could largely replace or supplement Sockeye salmon.

Bonito.—A high-grade product to replace or supplement pink or Coho salmon or some Sockeye.

Australian Salmon.—To replace or supplement the cheaper grades of North Pacific salmon.

Pilchards, Southern Herring, and Tasmanian Sprats.—These are equal in flavour to, and would replace, imported pilchards, sardines, and sild. They would be packed mainly by the second and third categories of canneries, though a large cannery might operate on pilchards at Port Stephens or Coff's Harbour if fishing boats and gear are available.

Barracouta.—A high quality fish which can be packed as smoked fish, or with salt or tomato sauce. This would partly serve to replace herrings in tomato sauce and possibly kippers, and has sufficient appeal to be regarded as a new and highly desirable product on the Australian market.

Mullet.—This fish stands in the same high category as barracouta, but supplies would be limited by several factors.

Crayfish, Crabs, etc.—There is a limited market for these which could well be supplied from our own waters (*e.g.*, Western Australia).

Shellfish.—Scallops are canned in Tasmania, but it might be possible to extend this industry. If oyster production could be stimulated, there would be a market for a canned product, smoked or fresh.

Experimental Data

Among a large number of other experiments the following are typical:

Oyster Canning

The oysters were thoroughly washed and scrubbed and steamed for 40 minutes at temperatures rising from 205° to 220° F. to open the shells. A few of the shells remained closed, but were easily prised open with a knife, and the meat was removed. The oysters were rinsed in a 10 per cent. brine and divided into two lots.

Lot A.—These were spread on a wire tray which had been oiled with cottonseed oil, placed in a smokehouse at about 110° F. for one hour, packed, and olive oil added.

Lot B.—These were packed in the can and 10 per cent. brine added, leaving ⅛ inch headspace.

The cans were then exhausted for 15 minutes at about 215° F., seamed, retorted for 60 minutes at 240° F., and cooled.

Both these packs were superior in appearance and flavour to the American and Japanese brands with which they were compared. Better results were obtained by reducing the smoking time to 20 minutes. It required 4 dozen oysters for each ½-lb. can, which, at present prices, represents a cost of about 1s. 6d. per can for the fish.

As these packs were satisfactory, prospective canners could well use the methods, smoking for 20 minutes in the case of the smoked product. This could be done in a tunnel kiln with wire tray or racks moving through the tunnel. The process would then be continuous.

Australian Salmon (*Arripis trutta*)

Although certain laboratory packs of this fish have been considered equal or superior to commercial and experimental products packed elsewhere in Australia, it is felt that a completely satisfactory pack has not yet been prepared. The commercial product from Australian canneries is, however, satisfying a definite section of the market, and appears to be taking a permanent place in Australia's fish supply. There is, however, a toughness of fibre and a peculiar flavour which does not appeal to certain palates, and which experiments have failed to eliminate. Toughness has been shown to be increased by freezing, fish held for one week at 10° F. being much tougher than the same fish canned immediately after landing. The addition of tomato sauce tends to improve the flavour, but tomato sauce packs have a limited popular appeal. On account of the unsightly nature of the bone, this Division has advocated the filleting of this fish.

(1) Fish were bled and gutted. The dark flesh was removed, and half the fish were filleted. Half of each lot was smoked for 2 hours, cut up, and packed in ½-lb. cans. Tomato sauce and salt were added and the fish retorted at 240° F. for 1 hour and then at 250° F. for ½ hour, with controls at 240° F. for 1 hour only. The fish were tough and the bones hard. The unsmoked fish were less tough than the smoked.

(2) Sodium nitrite (0·1 per cent.) was added to cans of freshly filleted fish (1 dessertspoonful per ½-lb. can). A second series was prepared by immersing for 5 minutes in 0·1 per cent. sodium nitrate solution. The cans were retorted at 250° F. for 1½ hours. The resultant packs had a pink exterior, but the flesh was still tough and the flavour only fair.

(3) There were two sections in this experiment—(i) cans packed with tomato sauce and arrowroot, and (ii) cans packed with half a ground anchovy in the can. The retorting time was 1½ hours at 250° F. The anchovy pack was the best to date and had a delicate brown colour which had penetrated through the flesh.

(4) Fresh fish captured locally by trolling were filleted and canned with Italian and Australian anchovies and salt, exhausted at 185° F., seamed, and retorted for 1½ hours at 250° F. These were the best salmon packs and an improvement in flavour on commercial packs. The flesh was comparatively tender and of a uniform brownish colour.

(5) Local salmon canned "chicken haddie" style. The fish were scaled, gutted, and washed, and then placed in saturated brine for 10 minutes. They were precooked at 160° to 185° F. for 45 minutes, and allowed to cool overnight. The white flesh was retained and packed in ½-lb. cans. A small portion of salt was added and the cans were sealed and retorted for 75 minutes at 10-lb. pressure (240° F.). The appearance was rather poor owing to the flaking of the fish. The flesh was white and the fish rather dry, but otherwise very palatable.

(6) A repetition of this experiment was made with the precooker rising from room temperature to 212° F. in 50 minutes and then held at this temperature for 10 minutes. The preliminary brining was inadvertently omitted. The cans were exhausted at 212° F. and retorted for 60 minutes at 240° F. The product was tough, and a further retorting for 60 minutes at 240° F. did not improve this quality. These fish had been frozen and all fish from this source were tough when canned. A second

batch with a longer pre-cook (25 minutes after reaching 212° F.) were not any better.

(7) A similar pack with the addition of cottonseed oil and salt was more palatable though somewhat tough.

(8) Further experiments on these fish included a straight pack with salt, one with anchovy and salt, and one with tomato sauce. The retorting times were 90 minutes at 250° F. and 75 minutes at 250° F. The tomato sauce pack retorted for 90 minutes was somewhat tough but otherwise quite good. The shorter time gave a tough product.

(9) Another "chicken haddie" pack with a pre-cook of 45 minutes gave a white pack of good appearance, but the fish were still somewhat tough though less so than in experiment (6). They were no tougher than the commercial packs, but would need to be much more palatable to warrant the extra handling.

It has been noticed in sampling commercial packs that texture varies considerably even in the same batch. This variation of quality appears in smoked "salmon" and seems to be a characteristic of the fish.

Pilchards

Two experiments have been conducted with pilchards.

The fish were scalded, headed and eviscerated, hung on tenters and allowed to dry for 1 hour, and smoked for 1½ hours. They were then packed in 1-lb. talls and 2 fl. oz. maize oil and 1 teaspoonful of salt added. The cans were seamed and retorted for 95 minutes at 240° F. The flavour of this pack was excellent, but the bones were unpleasantly hard.

In the second experiment the fish were scaled by shaking in a fish basket in salt water, and the heads and viscera were pulled off. The fish were then pickled in 60° brine for 7 minutes and half were smoked for ½ hour on wire trays, the other half being fried for 1 to 2 minutes in cottonseed oil. The fish were then packed in 4- and 8-oz. rectangular cans, olive oil was added, and the cans were retorted at 250° F. for 90 minutes. This resulted in a delightful pack, the smoked being the more tasty. Six fish could be packed into the ¼-lb. and 12 into the ½-lb. cans. The cans were designed by this Division to suit pilchard (sardine) or barracouta packs, and would cost at present rates just over 1d. and 1½d. each respectively, if ordered in sufficient quantity.

Southern Herrings

These were scaled and eviscerated, washed, brined 5 minutes in a 60° brine, drained, smoked for 15 minutes, and packed, some in olive, some in cottonseed oil. The cans were exhausted at 212° F. and retorted for 90 minutes at about 240° F. The olive oil was considered more pleasant than the cottonseed, but in each case the bones were very hard. In a second experiment the fish were treated in the same way except that half had cottonseed oil added and the rest had only salt added.

These two lots were retorted at 240° F. for 2 hours, which greatly softened the bones. The oil pack was considered an excellent substitute for imported sardines and pilchards. A third test consisting of two unsmoked, one packed with salt alone and the other with tomato sauce after pouring off the liquor, confirmed the fact that 120 minutes at 240° F. is necessary to soften the bones.

These fish are rather more difficult to handle than pilchards, as it is impossible to remove the viscera along with the head, and, owing to the shape of the fish, the scaling is not so easy. Southern herring occur in large quantities in the estuaries of the north coast of New South Wales and might prove an important subsidiary to a cannery operating on mullet, bonito, and mackerel tuna in this area.

Sprats (*Clupea bassensis*)

The fish were pickled in 80° brine for 10 minutes, headed and eviscerated in one operation, rinsed in the brine, and placed in oiled wire trays. They were dried in the sun and half were fried in cottonseed oil for 5 to 7 minutes, drained, and sun-dried, and the other half were smoked on the trays for 20 minutes. Both lots were packed in ½-lb. cans and 1½ fl. oz. olive oil added to each can. The cans were exhausted, seamed, and retorted for 90 minutes at about 240° F. The product was delicious, very like sild. Possibly the time of frying could be reduced to 2 or 3 minutes and smoking to 10 to 15 minutes for this size fish. These fish occur in Tasmanian waters.

Mackerel

After scaling, gutting, heading, and tailing, these fish were packed in ½-lb. cans, salt was added, and the cans were exhausted, seamed, and retorted at 240° F. for 90 minutes. The results were most promising.

A second and similar pack was not so successful. The fish were too loose and were discoloured.

A third experiment using 1-lb. cans was made, part smoked, part in tomato sauce, and part in American style. The flavour of each pack was excellent, and this fish packed as kippers (smoked 1 hour) or in tomato sauce in oval cans would be a very fine substitute for herrings. The possibilities of this fish are, technologically at least, very great.

Mullet

A number of experiments have been carried out in the canning of this fish, and only a brief summary of the results will be given.

(1) The fish were brined for various times prior to canning, and 1 per cent. acetic acid was added to one lot. At the same time some fish were salted and fried in maize oil in the can, and some packed with cottonseed oil and salt. The oil packs were rather less palatable than the others, and the acetic acid pack was the best. As the retorting time was 75 minutes at 240° F., the bones were still hard.

(2) Half the fish were smoked for 1 hour and the other half left unsmoked. Anchovy sauce was added to half the smoked and half the unsmoked fish, and tomato sauce to the other half, making four lots in all. The cans were retorted at 250° F. for 45 minutes or 240° F. for the same period, giving eight lots of cans. It was found that the bones were still hard at these temperatures, while smoking appeared to toughen the flesh.

The anchovy sauce gave an unpalatable pack while the tomato sauce pack much resembled herrings in tomato sauce.

(3) "Chicken haddie" pack. This was done in a manner similar to that for salmon. It resembled crab in flavour and appearance, but the result would not warrant the expense involved in the method.

(4) A further experiment with the following additions was carried out:

(*a*) Half teaspoonful of powdered agar and salt.
(*b*) Ground anchovy and salt.
(*c*) Tomato sauce and salt.
(*d*) Liquid essence of smoke and salt.
(*e*) Salt only.

Of these the last two were the best packs and the agar pack was not popular. Retorting at 240° F. for 90 minutes softened the bone adequately in this pack. The presence of "curd" marred the appearance of the pack, so a preliminary brining was tried.

(5) Half the fish acted as controls, and the rest were pickled in an 80° brine for 5 minutes. All were packed (some in tomato sauce), salt was added, and the cans were retorted at 240° F. for 75 minutes. This time was insufficient and the bones were still hard.

(6) After a 5 minutes' pickle of the cut pieces in 100° salinometer brine the fish were packed and the cans exhausted for 20 minutes, seamed, and retorted at 240° F. for 90 minutes. The flesh was very tender but the bones slightly hard. Curd was reduced to some extent in the brined cans. A similar test was made with a tomato sauce pack, and in this case also the bones were hard. Curd was not entirely overcome by brining.

(7) A further experiment was made with part of the fish brined 15 minutes in 60° pickle and smoked for 1½ hours. The other part had salt added, and some cans had hot tomato sauce added to the drained cans. The retorting time was 90 minutes at 240° F. In this case the bones were soft. The least interesting pack was the smoked fish, as a certain toughening seems to take place in the smoking. The other packs were very good, the tomato sauce pack being equal or superior to imported herrings in tomato sauce.

(8) The fish were prepared, cut up, and half were dipped for 5 minutes in a saturated brine with 1 per cent. sodium phosphate; the other half had vinegar added (1 tablespoonful per can). These cans were exhausted, seamed, and retorted as usual. The sodium phosphate apparently precipitated the proteins in the

(*Continued on page 41*)

BRITISH VEGETABLE DEHYDRATION
FOR HUMAN FOOD

Starting on a small commercial scale in 1935, the progress of the business of THE FARMERS' MARKETING AND SUPPLY CO., LTD., in vegetable dehydration has been remarkable. At the present time, five plants are in full production and a sixth is in course of erection. This article describes the original factory.

T. CROSBIE-WALSH, F.I.C.

MANY of those associated with the food industry for many years have seen this title before. Perhaps no other branch of food manufacture has made so many promising starts and met with fatal endings. Always a fascinating project, it has remained undeveloped. Something either in the conditions, supplies, methods, has so far—in this country at all events—withheld success from many enterprising and seemingly well-managed efforts over a period which might be put as the last half century.

Six Dehydration Factories

It was interesting and not a little surprising (as the work is not well known) to come across what appears to be a successful project in vegetable dehydration carried on by the Farmers' Marketing and Supply Company, Limited, who have five plants in full production in different parts of this country and a sixth in course of erection.

In examining the very simple processes used at one of the factories in Cambridgeshire, the opportunity presented itself of very full discussion with Mr. Robert Templeton, Managing Director of the Company, who, with his Co-Directors, are the originators and founders of this business. Formed with a small beginning in July, 1934, the Cambridge dehydration unit was one of their early enterprises. It commenced commercial-scale drying towards the end of 1935, and has extended its processes, its range of products, and its clientele in the six years which have gone by.

Range of Products

At the present time the Company's products of dehydration range from bulk, rough-dried potato and other root crops for cattle feeding to articles suitable for, and now used extensively in, the food industry, such as dried carrots, onions, parsnips, turnips, swedes, beetroot, parsley, mint, etc. Most of these articles are available either in powder, flake or kibbled form.

Even before the outbreak of war, as well as doing an extensive trade in bulk, rough-dried root crops for cattle feeding, the Company had succeeded in taking from German, Hungarian and Dutch manufacturers approximately 30 per cent. of the total trade among British food manufacturers. Some of the best names in the food industry have been amongst the Company's clientele in a gradually increasing list from 1937 onwards. The products are used for a variety of flavouring and filling purposes, covering a very wide field of the industry.

During the course of the author's visit every opportunity was given to examine the lay-out and various processes, which obviously exist in their present form as a result of a gradual improvement over several years of trial and error, and it was interesting to learn that very little of the existing runs and methods conform with the theoretical expectations upon which the factory was laid out.

Potato Drying

Very briefly, the essentials of the process now used are as follows :

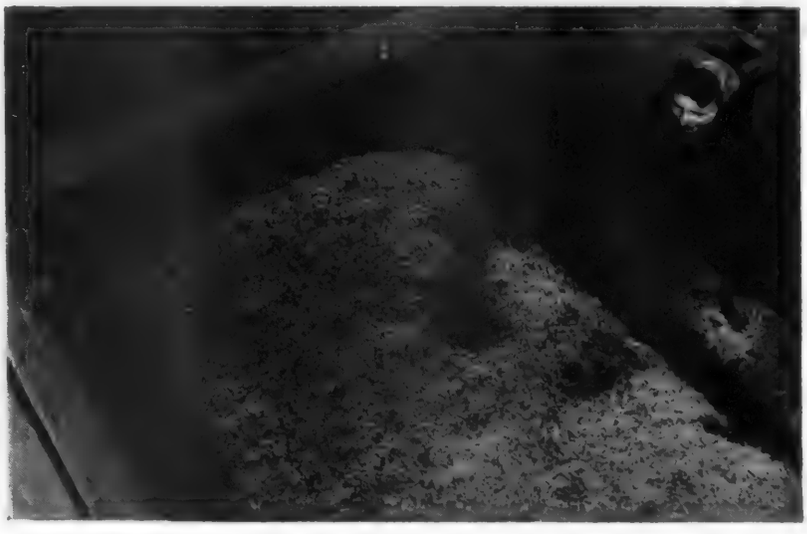
The potatoes arrive at the factory by road and rail and are tipped into flumes, which contain from 300 to 400 tons. In the course of conveying the potatoes by fluming to the washers, at the rate of 10 tons per hour, the amount of water used is 10,000 gallons.

The potatoes are, in the ordinary way, drawn from those grown in the immediate neighbourhood, and the stock in flume is usually maintained for a week's supply, which is a reserve sufficient for emergencies such as frost and transport delays.

Washing and Slicing

A considerable part of the cleaning operation is effected during the journey of the potatoes along the flume, and the final washing is carried out in a washer consisting of a narrow tank fitted with paddles which rub the potatoes against each other, thus completing the elimination of dirt by friction. The washer also acts as a remover of straw, string, stones and other foreign matter by special mechanical devices.

From the washer the potatoes travel by elevator through the wall of the factory into a bunker of 60 tons capacity. From this



Dried Potatoes emerging from the end of the Band Drier.

Giant Bunker with a capacity of 60 tons of potatoes. From this the potatoes are fed into the Slicing Machine.

The potatoes, after having been sliced, being conveyed to the Band Drier.

A view of part of the top of the Band Drier, which consists of three units forming separate ovens, the temperature in and the volume of air flow through which may be controlled separately.

bunker the potatoes are fed into a machine which slices them into pieces $\frac{1}{8}$ inch thick. From this machine the slices drop to a gutter, and here again the conveyance is effected by means of water. At the end of the gutter is another hopper which receives the material and from this the drying plant is fed.

For cattle food production the potatoes can receive a preliminary treatment in a rotary drier which reduces their moisture content to about 50 per cent. After this preliminary drying the product is finished on the band drier.

For potatoes destined for human consumption, on the other hand, the slices are taken direct to the band drier and the drying process carried out at low temperature so as to retain the whitest possible colour in the finished product by the avoidance of overheating.

The Band Drier

Drying is carried out by means of a band drier, which consists of three units forming separate ovens, the temperature in and volume of air flow through which may be controlled separately.

The third and last section of the drier is fed with air heated by condensing the exhaust steam from the generating set serving the plant, and this may be re-circulated and boosted in its passage through the remaining ovens and finally in part re-used in the air to furnace. In this way considerable economy in furnace fuel is effected.

Drying temperatures, of course, vary through very wide limits. What was probably a typical procedure was noted during the author's visit, when the three compartments of the drier through which potatoes were being passed was as follows :

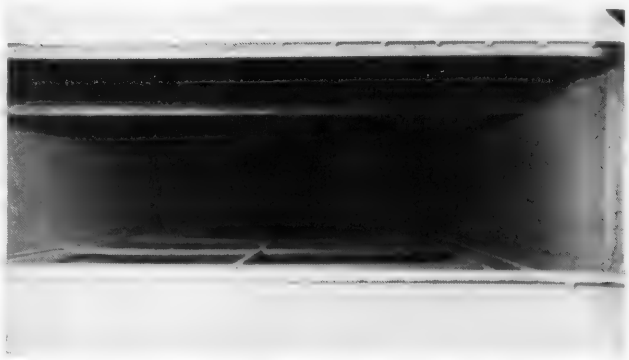
No. 3.	*No.* 2.	*No.* 1.
200° F.	220° F.	230° F.

the potatoes travelling from right to left.

At the delivery end of the drier the product is either sacked for further treatment or conducted direct to the pulverisers.

The treatment of each vegetable requires variations at almost each stage of the flow afore-described; particularly is this so

Potato-Slicing Machine.



Inspection window in side of Band Drier, allowing progress of drying to be observed.

in their passage through the drying tunnel where temperature and air flow can be, and must be, varied within quite wide limits according to whether, for example, a case-hardened, tough texture or a tender, powdery product is required in the finished article. Treatment will also depend on the colour desired and will vary with the susceptibility of each vegetable to heat.

Other Methods of Drying

The Company's other factories do not all follow the same process. The suggestion was made and endorsed by the management in this case that there is really no magic either in the process or in the word " dehydration "; a number of plants and methods can secure a desired result. Skill and patience are essential; suitable labour is vital. Indicating this, the company state that in addition to the band-drying system above described, they are elsewhere working alternative methods, as follows :

(*a*) Drying by steam-heated cylinders, where vegetables are first cooked, then pulped, and finally dried in a thin film which at the dry stage is cut from the steam-heated rollers.

(*b*) Drying by static method, where vegetables, after a normal preliminary treatment, are sliced or otherwise prepared and placed in static position in hot chambers and there left until dried.

(*c*) Drying by large rotary drums, heat being conveyed by the passage of large quantities of hot air through the moving product in the interior of the drums; this process, due to the bruising and discoloration of the vegetable, is mainly suitable for cattle feeding products.

A New Potato Product

Very interesting is a new project upon which a great deal of work is being devoted at present, the object of which is to find a method of extracting water from potatoes without bursting the starch granules of the potato, which normally occurs in the other processes of drying. It is apparently a fact that, however white in colour or palatable in flavour is the ordinary dried potato powder, this will not " reconstitute " into mashed potatoes owing to the stickiness produced by the bursting of the starch granules. The company in the early stages of the war acquired a patent already in use on the Continent, by which it is hoped shortly to make available a potato powder which by the simple addition of hot water will " reconstitute " and make, practically instantaneously, mashed potatoes of the same appearance, flavour and digestibility as the appetising dish it is accustomed to prepare at present by the very much more laborious household process. The value of such a product when available to the Services is so obvious as not to require emphasis.

The Elements of Success

Reverting to the opening paragraphs of this article, Mr. Templeton was asked to what causes he attributed the present position of very promising success in the matter of vegetable dehydration in view of the failure which had attended previous

projects. The following is the expression of his personal opinion, which, coming from one who has played such a prominent part in developing this industry, constitutes a valuable record.

(1) This Company (he said), like others, found its early years in dehydration extremely difficult, due to the uncharted nature of the work to be done. Considerable development costs had to be faced before a profit-making stage was reached. Without the advantage existing in this case of a profitable business in other directions, it is open to some doubt whether any company founded solely for the purpose of dehydration would have been able to persevere against unexpected difficulties.

(2) It is indeed doubtful whether a project for dehydrating vegetables solely for human food could, over a period of years, pay its way. Visualising such a factory, its costs per ton of dried product would be extremely high, the point being often overlooked that as much as fifteen tons of water must frequently be evaporated to obtain only one ton of dried product. The costs of labour, handling coal, overheads, etc., can easily defeat a well-intentioned effort.

(3) In the case of the project under review, there is a much wider-spread development. Allied to a national business in the manufacture of animal feeding-stuffs, the drying factory side can range over and alternate between bulk, rough drying for cattle food to the more refined and much slower processes which can be carried out simultaneously and share common overheads as well as other important costs.

The Function of Drying Units

(4) It was explained that under peace-time conditions the drying factories operated as contractors to the Potato Marketing Board, this body having supported from its inception the principle that small-sized drying units, well spread about the country, were essential for the proper marketing of potatoes—e.g., the absorption of rough-size stocks unsuitable for the housewife demand, and clearance of real surplus in occasional years. The existing organisation of the company developed from an agreement between the Potato Marketing Board and the company, under which the former concern enjoyed rights over the factories' bulk drying capacity whenever wanted for the purposes indicated above. In short, the foundation of the enterprise is the necessity for well-placed drying capacity to absorb the surplus of our principal vegetable—the potato—and it is this foundation which permits, apparently for the first time, the development of the finer forms of dehydration for human food on a sound and economic footing.

Finally, in reply to the question whether the Company considered that their products could be used, not only by food manufacturers as they are already being used, but in the much bigger market composed of the domestic consumer, the answer was: "No, not at present, not so long as fresh vegetables are available." It is frankly admitted that, although a great deal of patient work has been done—and one must agree the present position is very good evidence of it—the colour and physical appearance of the dried, shredded products are not yet such as to command the serious interest of the housewife. To achieve this will be a matter of time; the company has great hope, for example, of its mashed potato product, but for the rest the present answer is: "Not yet."

In conclusion, a very favourable impression was gained of what seems to be an extensive piece of organisation and work, covering many years from 1936 onwards, achieving as stated above no less than 30 per cent. of the existing market for dried vegetables at the expense of the old-established and other products by the time of the outbreak of war. If vegetable dehydration is indeed a difficult business, in this case it is in the hands of a very cautious as well as a very patient management. In answer to the query as to whether they did not now fear competition, the reply was that, on the contrary, it would be welcomed from any concern willing to face a similar effort and undertake similar risks of capital in developing so promising an idea.

The author's thanks are due to Mr. Robert Templeton, Managing Director, and also to Mr. E. G. Rhodes, Managing Director of Messrs. Geo. W. Rhodes and Son, Ltd., Sole Agents for the Company, without whose collaboration this article could not have been written.

THE NEW HEALTH AND PENSIONS INSURANCE ACT, 1941

THE National Health, Insurance and Contributory Pensions Act, 1941, Part I, with other provisions, brings into this insurance field non-manual workers, with earnings up to £420 p.a. (changed from £250 p.a. limit), and increases contributions and benefits, all these provisions operating from January 5, 1942; manual workers are compulsorily insurable no matter what are their earnings.

Contributions are increased by twopence weekly, the employer paying one penny, the employee one penny of the increase, so the new stamps will cost 2s. for men and 1s. 7d. for women, but the employer can recover 1s. and 10d. respectively from the employee.

The employer is responsible for the contributions in respect of men who have reached the age of 65, women 60, and these have been increased by one penny, the new rates being 1s. for men, 9d. for women.

Benefits are increased by 3s. weekly all round, the new full Sickness Benefit being 18s. for men, 15s. for spinsters and widows, 13s. for married women. For Disablement Benefit the new rates are 10s. 6d., 9s., and 8s. respectively. Where a person is not fully qualified (that is with an insurance history of two years or more with 104 contributions paid) reduced rates apply, but only if insurance has been for six months or more with 26 contributions registered, the new rates being for men 12s., for women 10s. 6d. weekly.

Voluntary Contributors (Ordinary)

As the term "employed rate" is used in the Act in relation to contribution increases, it may be thought that the voluntary contributor is not affected, but under the older Acts it is stated that voluntary contributors pay at the "employed rate" (employer's and employee's share combined). Therefore, voluntary contributors will pay 2s. (from 1s. 10d.) for men, 1s. 7d. (from 1s. 5d.) for women, that is, if insured under the combined scheme (Health and Pensions together). If insured separately for Health Insurance, the stamps will cost 11d. (from 9d.) for men, 10½d. for women (from 8½d.). The increased benefit rates are available for voluntary contributors, however, and the following should also be noted.

For ordinary voluntary contributors there is no earnings or income limit as regards entering insurance, but medical benefit is not available if the total income is over a certain amount. Until this Act, the income limit was up to £250; now medical benefit is available to persons with a total income not exceeding £420 a year. Where a person is not eligible for medical benefit (above £420 total income) the contribution is 3d. weekly less.

The increase in the earnings limit will mean the transference of certain voluntary contributors back to the employed class (with part of the contribution paid by employer), these being those who continued in voluntary insurance, after earnings had gone over £250 a year, and similarly persons who went out of insurance when salary went above the limit will be again compulsorily insurable, in both cases applying to those with earnings between £250 and £420 p.a. Where the voluntary contributor is self-employed or an employer, the position remains unaltered, although medical benefit, as explained earlier, may now be available by the income limit for this purpose being raised, but, of course, the increases in contributions and benefits will apply.

In determining need for an Unemployment Allowance or Supplementary Pension, a certain amount of any Health Insurance benefit being drawn is disregarded for assessment of income; now only any amount above 10s. 6d. will apply, as income, previously only 7s. 6d. being disregarded.

Although alterations in rates of Benefits, Pensions, and Contributions or in the proportion of Health Insurance contributions (6/7ths men, 4/5ths women) to apply for Benefit and Administration Expenses, will still require a new Act of Parliament, this 1941 Act gives power to the Ministry of Health to deal with matters necessitating alterations through the presence of war conditions, by Orders, although such an Order must be laid before Parliament, and can be amended by either the House of Commons or Lords, if it so desires, before becoming permanent law.

JAMS AND VITAMIN C

A brief account of some experimental work in the jam factory

GEORGE H. RAUCH

THE experiments described were carried out over a period of nearly three years, and, while not being by any means complete, they may form a small contribution to the subject.

As is well known, ascorbic acid is, in the state it is found in plants, extremely sensitive to different influences. It is oxidised by heat, and by alkalies. In alkaline media oxidation takes place at room temperature and it is further catalysed by many metals.

Up to the present time no preserves with an addition of pure ascorbic acid have been available, though the therapeutic as well as dietetic value of such foods is obvious enough. The reason for this may be found in the fact that a stability of ascorbic acid persistent enough for practical purposes could not yet be ensured. The results of these investigations have proved that it is possible to provide jams, obtained in the usual way by boiling fruit or fruit pulp with sugar, acid and pectin, with an addition of ascorbic acid, subject to certain precautionary measures.

Ascorbic acid to an amount of 0·1-0·4 per cent. added as rapidly as possible to the jam when it had cooled down to 55°-60° C., and before the process of setting had taken place while stirring with utmost possible exclusion of air and avoiding contact of the product with catalytic agents such as copper, etc.

Control analyses were made after 1 week, 4 weeks, 2 months and 3 months. The stability of the ascorbic acid was found to be satisfactory, although the figures showed a continuous decline. The analytical figures were as follows:

Sample.	*Addition of Ascorbic Acid gms. per 1 kg.*	*Gms. Ascorbic Acid per 1 kg. by Analysis.*				
		May 8.	*May* 15.	*June* 15.	*July* 15.	*Aug.* 15.
a	1·00	1·52	1·45	1·32	1·19	1·02
b	2·00	2·34	2·25	2·11	1·98	1·72
c	3·00	3·41	3·33	3·14	3·01	2·86
d	4·00	4·36	4·28	4·07	3·74	3·51

Modifications in Jam Boiling

Instead of producing jam in the usual manner, as indicated, a process which is liable partly to destroy both the subtle fruit flavour and the natural vitamin C content, another method was adopted. Adding citric acid and sugar, the fruit or fruit pulp was heated for several hours at 35°-40° C., which temperature was slowly increased to 60° C. until an even mixture was obtained. The natural flavour was preserved intact. At this stage of the process the pectin was added and the mixture heated at 60° C. for a short time. Subsequently the process was carried on as above described while adding ascorbic acid. The keeping properties of the jam were as good as jam boiled in the usual manner, while the taste is considerably improved.

It might have been concluded that the favourable results of increasing the stability of vitamin C were on the one hand due to the fact that the process of admixture of ascorbic acid to the jam took place at the optimum temperature of 55°-60° C., with the maximum possible exclusion of air, and on the other hand partly due to the peculiar effect of pectin on the physical structure of the mixture. However, further experiments demonstrated the rather surprising fact that the stability of ascorbic acid is not considerably affected even if all the aforementioned basic conditions presumed essential for the preservation of ascorbic acid are disregarded.

Equally favourable results were obtained with products to which the ascorbic acid was added at 90°-95° C., with complete disregard to the exclusion of air and where no pectin had been previously applied.

Ascorbic acid of 0·4 concentration was added to raspberry jam heated to 90° C. An analysis made after the setting took place showed there still remained the whole amount of the ascorbic acid added. A further analysis after 3 months' storage proved good survival of the vitamin. All these experiments were made alternatively using fresh fruit and pulps preserved with sulphur dioxide and benzoic acid. No substantial difference in the results was observed.

Addition of Ascorbic Acid to Finished Products

A further series of experiments revealed that ascorbic acid can be added to finished products, without seriously affecting the stability of vitamin C, no matter how long these products were stored.

For these experiments apricot jam was used. The jam was taken from the stores—the vitamin C content being found to be 0·009 per cent. The jam was subsequently mixed at room temperature with 0·4 per cent. ascorbic acid, this addition being checked by a control analysis.

One sample was heated for 30 minutes to 100° C. Another sample was stored without heating. Both samples showed after 2 weeks, and later after 3 months, of storage approximately the same content of ascorbic acid as when fresh.

Effect of Sugar Concentration

An experiment was made with a solution of 2 per cent. of ascorbic acid in a solution of cane sugar of 60 per cent. concentration. After boiling the mixture in a water bath for 30 to 60 minutes the ascorbic acid remained stable, but after diluting the mixture to 5 to 10 times of its volume a rapid decline of stability was observed. The experiments were repeated with the same results with solutions of cane sugar and citric acid. These experiments tend to prove the fact that higher sugar concentrations have a protective influence on ascorbic acid.

Another series of experiments proved that jams produced under the above-mentioned conditions and afterwards diluted with water to 5 to 10 times their volume showed a rapid diminution of their ascorbic acid content. It appeared that the speed of this was in proportion to the dilution of the product. Jams diluted to 15 times their volume showed a very considerable decline within a few hours and after 2 to 3 days the ascorbic acid had almost entirely disappeared.

Ascorbic Acid in Aqueous Solutions

It was proved, however, contrary to expectation, that aqueous solutions of ascorbic acid show considerable stability. Tests were made with solutions of pure ascorbic acid in concentrations of 6, 4, 3, 1 and 1/10 per cent. According to the general view, the amount of ascorbic acid should rapidly decline on storing, and even more after boiling in the presence of air. This was not the case. The stability of the highly concentrated solutions was surprisingly good. The stability even of weak solutions was comparatively high. The ascorbic acid was in fact stable, not only for days but for weeks, and the solutions showed only a slow decline of their vitamin C content.

The appearance of mould on some of the samples did not prove a noticeable influence, although very weak solutions, for example of 1/100 per cent., showed a loss within 2 days.

It might be therefore assumed that the stability of ascorbic acid in aqueous solutions is in proportion to the concentration of the solution, the stronger concentration the greater the stability.

These experiments lead to the conclusion that the stability of ascorbic acid is influenced by factors which are not yet fully understood.

Further experiments revealed that vitamin C can be added without subsequent loss in a similar way to fruit juices.

The experiments described appear to indicate that ascorbic acid may be added and preserved for a considerable time in jams, marmalades and fruit juices.

FOOD ANALYSIS

PROGRESS IN 1941

Part II

The second instalment of a well-documented article dealing with new, and modifications of older, methods for the analysis of the different classes of food.
Part I, published in January, discussed the analysis of the products of milk, eggs, meat and fish, fruit, fats and oils, sugar, tea, coffee, cocoa and also fermentation products.

D. W. GROVER, B.Sc., A.I.C.
The British Association of Research for the Cocoa, Chocolate, Sugar, Confectionery and Jam Trades.

TWO papers dealing with the estimation of starch come from U.S.A. One is a survey of known polarimetric methods,[35] only two of which were found reliable: the diastase-acid method for conversion to dextrose, and the Mannich-Lenz method, in which starch is dissolved in calcium chloride solution. The latter is suitable only for pure starches. With natural products, filtration is very slow. Another polarimetric method which is applicable to root vegetables[36] comprises leaching out sugars with dilute alcohol or water, solution of the starch in sodium hypochlorite solution, and polarising.

The identification of gums in foodstuffs is not an easy task. A scheme for doing so, based on the use of thorium nitrate and lead acetate, is described by Bryant.[37] The reactions of nine commercial gums to these salts are tabulated.

Sodium alginate is a popular stabiliser in ice cream and other dairy products. It may be detected by means of a pink colour formed with a special ferric sulphate/sulphuric acid reagent.[38] Preliminary separation of the gum in a comparatively pure condition is necessary for the success of this test. A rapid sorting test for sodium alginate makes use of the fact that it is usually associated with dextrin in the commercial product.

Flavouring Materials

Standard methods for estimating free alcohols in essential oils have been criticised on several grounds. Both the B.P. and the U.S.P. methods involve esterification with acetic anhydride, separation of the esterified oil and determination of the ester value on a weighed quantity. Possible sources of error are (1) esterification of other constituents, (2) washing ingredients out of the esterified oil during its separation, (3) resinification or hydrolysis of other constituents during determination of ester value when the oil is boiled with alcoholic potash. The methods are also cumbersome and time-consuming. To replace such methods, Grove[46] proposes to treat the essential oil with a known volume of esterifying agent and to determine the excess of the latter by titration after hydrolysis with water. Several esterifying agents containing pyridine were investigated, and of these a mixture of acetic anhydride, pyridine and xylene is probably the most useful. The results obtained with peppermint, rosemary and sandalwood oils are lower than those obtained by the U.S.P. method, and probably nearer the truth. Similar considerations lead Brignall[47] to adopt a mixture of acetic anhydride and *n*-butyl ether as acetylating agent. The latter solvent is considered preferable to pyridine, on account of its less objectionable smell and more suitable boiling point.

The volatile oils from cassia barks from any one source are found to be of fairly constant composition,[48] whereas considerable variation occurs between barks from different sources. The constants of the oil can therefore be of some help in deciding the origin of a bark. None of the oils from cassia bark come up to the standards for oil of cinnamon.

Although vanillin is responsible for part of the flavouring value of vanilla beans, their quality as judged on the market is not at all well indicated by the vanillin content. Balls and Arana[49] have described a colorimetric method for determining total phenols in vanilla, and conclude that flavouring quality is well indicated by the amount of phenols other than vanillin. The analytical figures obtained for a number of commercial beans are given in the following table, in which beans of higher commercial value come higher in the table:

COMPOSITION OF VANILLA BEANS

Source.	*Moisture.*	*Total Phenols.*	*Vanillin.*	*Phenols, Less Vanillin.*
Mexico ...	37·69	5·13	1·94	3·19
Madagascar	32·32	6·50	3·75	2·75
Comores ...	31·91	5·00	2·83	2·17
Tahiti ...	30·41	3·24	1·84	1·40

The method used for determining total phenols was straightforward. An extract of the beans was allowed to react with Folin-Ciocalteau reagent,* and the blue colour produced with phenols was measured with a spectrophotometer, using light of 750 mμ wave-length.

A method for the determination of coumarin[50] in tonka beans comprises treating an alcoholic extract of the beans with diazotised *p*-nitraniline, which couples with the coumarin, forming a dye which is estimated photometrically.

The commercial quality of paprika has been found to be fairly well indicated by the intensity of the red colour extracted by ether.[51] This fact is the basis of a colorimetric method for the evaluation of this spice.

Chemists of the Government Laboratory have published a method for estimating dulcin in the crystalline product and in beverages.[52] It comprises hydrolysis of the dulcin with 18N sulphuric acid and estimation of the ammonia liberated on steam distillation from alkali. Beverages are first extracted with light petroleum to remove essential oils, etc., and then with ethyl acetate to separate the dulcin.

Diethyleneglycol monoethyl ether is used as a solvent for flavours, and a method for its determination is consequently of interest. One proposed by Shupe[53] is based on conversion into its xanthate by reaction with carbon bisulphide and caustic potash. The xanthate is then extracted by means of an acetone/benzene mixture, dissolved in water and titrated with iodine. The melting point and iodine value of the xanthate, which may be isolated in a crystalline condition, are used to confirm the presence of diethylene glycol monoethyl ether. For preliminary separation, use is made of its high boiling point and solubility in solvent mixtures.

Preservatives

In applying the Monier Williams sublimation method for the determination of benzoic acid, Sutton and Hitchen[54] found that errors occur unless a sufficently high temperature is reached inside the sublimation tube. The correct heating conditions were found to be 2 hours at 180° C. Dyer, Taylor and Hamence[55] have determined the apparent sulphur dioxide in different varieties of onions by the Monier Williams method. All varieties gave evidence of this preservative, the volumetric figure always being lower than the gravimetric. The authors conclude that this difference is due to the oxidation of volatile sulphur compounds to sulphates without the production of the equivalent quantity of acid.

* *J. Biol. Chem.*, 1927, **73**, 627.

After a critical study of a number of qualitative tests for boric acid, Michel[56] selected a modified turmeric reaction as being most sensitive and selective.

Heavy Metals, etc.

A review of methods of determining traces of copper by means of carbamate (diethyldithiocarbamate) has been made by Greenleaf.[57] He describes how satisfactory separation of copper from interfering metals prior to the carbamate reaction may be effected with sulphide or dithizone. If the former is used, the presence of a small quantity of lead greatly facilitates the separation of copper sulphide. A polarographic technique has been found satisfactory for determining copper in plant material.[58] Interfering metals are removed with ammonia. For the rapid routine determination of copper and iron in butter it is not necessary to ash the sample.[59] Instead it may be treated with hydrochloric acid, centrifuged, and the two metals determined on the serum by means of guaiac and thiocyanate respectively.

A thorough study of the literature dealing with the thiocyanate reaction for iron has led to the following recommendations.[60] The test should be made in slightly acid solution, and the coloured compound be extracted with ethyl acetate. The test is specific if ions precipitated by sulphuretted hydrogen are removed. Oxidising agents should be removed by sulphite, iodides by the addition of some nitrite, and the iron completely oxidised to the ferric state by bromine.

A polarographic method for determining lead, due to Cholak and Bambach,[61] while having no outstanding advantages over established methods, is of interest as presenting a new technique. A careful separation of lead from interfering metals is necessary, and can best be achieved by a combination of dithizone extraction and electrolysis.

Separation of interfering metals is the chief difficulty in applying the dithizone reaction to zinc, which gives rise to a red compound. Cowling and Miller[62] overcome this by extracting the zinc dithizone complex in the presence of carbamate. Previous workers had observed that in this manner interfering metals are eliminated. The steps in the analysis are (1) ash and extract with hydrochloric acid, (2) separate zinc and other metals as their dithizone complexes in chloroform, (3) extract zinc from copper and excess dithizone with N/50 hydrochloric acid, (4) extract zinc with dithizone in presence of carbamate, (5) estimate the zinc/dithizone complex photoelectrically.

Methods for the estimation of traces of fluorine in food products proposed in two papers[63] comprise detailed improvements in existing methods, including a closed apparatus for preliminary wet ashing, which avoids errors due to volatilisation.

War Gases

Three papers dealing with the detection of war gases in foodstuffs have appeared in the *Analyst*. The problem has, in common with many routine tests, the necessity for speed rather than accuracy. The general problem of identifying war gases in foods is the subject of a collaborative paper by members of the staffs of the Chemical Defence Research Division, Ministry of Supply, and the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery and Jam Trades,[64] who devised a scheme of analysis. It is not likely, however, that food chemists will be called upon to identify the gases contaminating their products. More probably they will have to obtain an idea of the extent of contamination by some gas whose identity is already known. This aspect as regards arsenical gases is dealt with by Williams[65] and Stainsby and Taylor.[66] The first author proposes a rapid digestion method, similar to the Kjeldahl digestion, to replace the more lengthy procedure recommended by the Chemical Defence Research Division. Stainsby and Taylor describe results obtained with an even more rapid test, in which the material is digested with caustic soda, transferred to the bottle of a Gutzeit apparatus, and the arsine liberated with zinc and stannated hydrochloric acid. Unfortunately, this method is applicable only to Lewisite. The arsenical smokes "Dick" (ethyl dichlorarsine) and Lewisite III do not produce arsine under these conditions.

REFERENCES

1 Wichmann, *J.A.O.A.C.*, 1941, **24**, 441.
2 Nichols and White, *Ind. Eng. Chem.* (anal.), 1941, **13**, 251.
3 Pavlov, *Lab. Prakt.* (*U.S.S.R.*), 1940, 15, No. 6, 22. (C.A., 1941, **35**, 813.)
4 J. G. Davis, *Food Manuf.*, 1941, **16**, 133.
5 Thomas and Davies, *Welsh J. Agr.*, 1940, **16**, 231.
6 Hillig, *J.A.O.A.C.*, 1941, **24**, 744.
7 Ludington and Bird, *Food Research*, 1941, **6**, 421.
8 Haenni, *J.A.O.A.C.*, 1941, **24**, 119.
9 Kluge, *Z. Unters. Lebensm.*, 1940, **80**, 209. (C.A., 1941, **35**, 1884.)
10 McVey and McMillin, *J.A.O.A.C.*, 1940, **23**, 811.
11 McVey, *J.A.O.A.C.*, 1941, **24**, 928.
12 Rosa and Mazzarachio, *Rend. ist. sanita pubblica*, 1938, **1**, 269. (C.A., 1940, **34**, 5554.)
13 Piegai, *Ind. ital. conserve*, 1939, **14**, 135. (C.A., 1940, **34**, 5555.)
14 Calderwood and Armstrong, *J.A.O.A.C.*, 1941, **24**, 154.
15 Shinn, *Ind. Eng. Chem.* (anal.), 1941, **13**, 33.
16 Ingram, *J.S.C.I.*, 1941, **60**, 126.
17 Bradley and Bailey, *Food Research*, 1940, **5**, 487.
18 Anon., *J.A.O.A.C.*, 1941, **24**, 75.
19 Scott, *ibid.*, 1941, **24**, 165.
20 Dastur and Lea, *Analyst*, 1941, **66**, 90.
21 Stansby, *Ind. Eng. Chem.* (anal.), 1941, **13**, 627.
22 Clark and Rugg, *ibid.*, 1941, **13**, 243.
23 Beier (abstr.), *Chem. Zentr.*, 1939, II, 1411. (C.A., 1941, **35**, 3720.)
24 Sutton, Barraclough, Mallinder and Hitchen, *Analyst*, 1940, **65**, 623.
25 Dyer, Taylor and Hammence, *ibid.*, 1941, **66**, 355.
26 Williams, *ibid.*, 1941, **66**, 3.
27 de Grey and de Moise, *Ind. Eng. Chem.* (anal.), 1941, **13**, 22.
28 Morell, *ibid.*, 1941, **13**, 249.
29 Becker and Englis, *ibid.*, 1941, **13**, 15; Yosida, *Rept. Govt. Sugar Exptl. Stn. Tainan, Formosa*, 1940, No. 7, 72. (C.A., 1941, **35**, 5735.)
30 Jackson and McDonald, *J.A.O.A.C.*, 1941, **24**, 767.
31 Phillips, *ibid.*, 1941, **24**, 181.
32 Thaler, *Z. Unters. Lebensm.*, 1940, **80**, 438. (C.A., 1941, **35**, 2235.)
33 Nicholson and Archibald, *Biochem. J.*, 1941, **35**, 721.
34 Salini, Kindt and Puliga, *Ind. sacchar. ital.*, 1941, **34**, 29. (C.A., 1941, **35**, 6477.)
35 Etheredge, *J.A.O.A.C.*, 1941, **24**, 113.
36 Balch, *Ind. Eng. Chem.* (anal.), 1941, **13**, 246.
37 Bryant, *ibid.*, 1941, **13**, 103.
38 Schroeder and Racicot, *ibid.*, 1941, **13**, 165.
39 Kidd, Nanji and Edwards, *Analyst*, 1941, **66**, 240.
40 Matchett, *J.A.O.A.C.*, 1940, **23**, 768.
41 Berua and Roberts, *Biochem. J.*, 1940, **34**, 1524.
42 Kapaller, *Z. Unters. Lebensm.*, 1938, **78**, 393. (Brit. Chem. Abs., *B*, 1940, 638.)
43 Rosenblatt and Peluso, *J.A.O.A.C.*, 1941, **24**, 170 and 225.
44 Gough, *J. Inst. Brew.*, 1941, **47**, 149.
45 Anon., *J.A.O.A.C.*, 1941, **24**, 695.
46 Grove, *ibid.*, 1941, **24**, 465.
47 Brignall, *Ind. Eng. Chem.* (anal.), 1941, **13**, 166.
48 Clavenger, *J.A.O.A.C.*, 1941, **24**, 461.
49 Balls and Arana, *ibid.*, 1941, **24**, 507.
50 Meyer, *Pharm. Tijdschr.*, 1940, No. 8, 7. (C.A., 1941, **35**, 2092.)
51 Neusbaum, *Food Inds.*, 1941, **13**, No. 10, 61.
52 Hirst, Holmes and Maclennan, *Analyst*, 1941, **66**, 450.
53 Shupe, *J.A.O.A.C.*, 1941, **24**, 936.
54 Sutton and Hitchen, *Analyst*, 1940, **65**, 502.
55 Dyer, Taylor and Hammence, *ibid.*, 1941, **66**, 9.
56 Michel, *Microchemie ver Microchem Acta*, 1941, **29**, 63. (C.A., 1941, **35**, 5412.)
57 Greenleaf, *J.A.O.A.C.*, 1941, **24**, 337.
58 Reed and Cummings, *Ind. Eng. Chem.* (anal.), 1941, **13**, 124.
59 Schwarz and Fischer (abstract), *C.A.*, 1941, **35**, 4108.
60 Vanossi, *Anales asoc. quim. argentina*, 1941, **29**, 48. (C.A., 1941, **35**, 6213.)
61 Cholak and Bambach, *Ind. Eng. Chem.* (anal.), 1941, **13**, 583.
62 Cowling and Miller, *Ind. Eng. Chem.* (anal.), 1941, **13**, 145. Also *J.A.O.A.C.*, 1941, **24**, 521.
63 Clifford, *J.A.O.A.C.*, 1941, **24**, 350. McClendon and Foster, *Ind. Eng. Chem.* (anal.), 1941, **13**, 280.
64 *Analyst*, 1941, **66**, 44.
65 Williams, *ibid.*, 1941, **66**, 228.
66 Stainsby and Taylor, *ibid.*, 1941, **66**, 233.

FRUIT AND VEGETABLE DRYING IN AMERICA

A short *résumé* of work on vegetable and fruit dehydration, as carried out in the United States of America, and details of a new drier.

A VERY thorough collection of information about the drying of fruits and vegetables has just been published by the United States Department of Agriculture as Circular No. 619.[1] It is written by E. M. Chace, principal chemist; W. A. Noel, associate industrial engineer; and the late V. A. Pease, associate microscopist. The Circular has 46 pages and several illustrations, contains a list of United States patents referring to its subject since 1915, and has an extensive list of references relating mainly to American literature.

The outstanding advantage of drying as a method of preserving foods is that the weight and bulk of the products are greatly reduced, thus making possible economies in storage and transport. The production costs of dehydration compare favourably with those of canning. Dried fruits and vegetables are almost as convenient for use in the home as are the fresh products; the dried products need no peeling or other preliminary treatment, and soaking and cooking can often be combined. Only the quantity required need be used when the package is opened; the rest will keep in good condition for a reasonable time. After pointing out these advantages and giving figures of U.S. production of dried fruits and vegetables for several years, the Circular proceeds to give a practical discussion of the various types of drying plant and of the preliminary preparation of material intended for drying.

Types of Driers

The following commercial types of driers are discussed: (1) *Vacuum Driers.*—These are said to be seldom used in large-scale operations on the usual commercial grades of fruits and vegetables. (2) *Natural-draught Driers.*—Cost less to build than forced-draught driers, but their operation is less efficient and more expensive. Recirculation is rarely practical, consequently heat is wasted. (3) *Forced-draught Driers.*—The greater efficiency and economy of forced draught combined with recirculation was clearly demonstrated some fifteen years ago by the Bureau of Agricultural Chemistry and Engineering[2] and by the Oregon Agricultural College.[3] As a result, many operators of tunnel driers have substituted forced draught and recirculation for the natural draught previously used. (4) *Conveyor-belt Driers.*—These have limitations which make them less practical as a rule than tunnel and *compartment driers.* (5) These have a drying chamber divided into several compartments, each holding one or two stacks of trays, the trays being piled conveniently on trucks. Air is carried from the heaters through a main duct, from which portions are diverted to each compartment. The air is discharged from each compartment into a recirculation duct, to be either reheated or discharged from the drier without passing through any other compartment. (6) In *tunnel driers* the drying is done in a long chamber or tunnel, in which both the materials and the air move horizontally for the most part. The course of the air is usually counter to that of the material, though some operators recommend that both should flow in the same direction. (7) *Rotary, or Drum, Driers.*—In one type the dry material is within a revolving drum; in the other it is on the outer surface. (8) *Spray Driers* are also of two types: nozzle and disc. Juice and pulps may be dried as spray after suitable modification.

Some engineering aspects of drying are given, such as the heat units (B.T.U.s) furnished by various fuels, methods of heating (direct heat, direct radiation, indirect radiation), air supply (fans and ducts) and moisture relationships. The subject of the relation of drying conditions to drying rate and quality of product is gone into very fully, and some of the points may usefully be given here.

Humidity Relationships

In general practice the temperature of the air entering the drying chamber should not exceed 160° to 170° F. The humidity at the air-outlet end of the drier should not greatly exceed 65 per cent. In driers employing recirculation, the conditions of temperature and humidity may be largely controlled by varying the recirculation. The velocities of air flow which produce the most efficient results in the drying chamber depend upon several conditions. In general the rate of drying increases with the velocity of air movement; low air velocities tend to bring about slow and uneven drying. Air velocities of 600 to 800 ft. per minute are satisfactory in tunnel driers; lower velocities are permissible in compartment driers. The most practical means of removing moisture from the air, and at the same time of conserving heat, is through the steady discharge of *a portion* of the air leaving the drying chamber. The rest dries efficiently when mixed with fresh air from the outside and reheated before recirculation. All forced-draught driers, therefore, should be provided with recirculation ducts connecting the air-outlet end of the drying chamber with the heaters and with dampers controlling the air discharged, recirculated, and drawn from the outside.

More than four pages are devoted to engineering calculations for designing a tunnel drier with recirculation of air and having an assumed capacity of two short tons of fresh prunes daily, the drying period being about 25 hours. When the drier is to be used for several materials, separate computations must be made for each, so that the drier will fulfil the requirements for all. Such calculations are useful in designing a new drier and in remedying the defects of one already in operation.

A New Type of Drier

After several years of research by the United States Department of Agriculture, in which practically all types of driers and the problems connected with them were studied, a compartment-type duplex dehydrator was built at Los Angeles, California, and was operated on a semi-commercial scale for drying fruits and vegetables.[2] This apparatus and the principles involved in its design and operation[4] suggest improvements in drying practices with many other materials. This type of drier is especially adapted for drying vegetables, and is also well suited for drying fruits. In designing the dehydrator, cognisance was taken of the cooling effect of evaporation on a drying medium, as demonstrated by the wet bulb of the hygrometer. It was undertaken to develop a type of drier in which it would be possible to use maximum temperatures at the time of maximum evaporation from the product being treated, and also enable control of temperature and humidity of the drying medium (air), as well as its distribution throughout the drying chamber.

The design of the drier (of which a detailed description is given) rested upon two principles. (1) Proper distribution of conditioned air is extremely important. (Heat is not an expensive item in the total cost of dehydration. Uniformity of drying, however, is essential; its absence is troublesome and leads to losses and high costs.) (2) It is still cheaper to move air than to heat it. The drier is designed in such a way that any serious lack of uniformity can be imputed to improper grading, sizing, or spreading of the material on the drying trays. As will be seen, this chamber or compartment type of drier possesses one feature of great importance when vegetables are being processed.

Scientific Drying

As the rate of evaporation is in direct proportion to the temperature, it is advisable to start the drying with a high temperature and suitable humidity, and gradually to reduce the temperature and humidity to the end of the drying period, for at the end of the drying period the product will have but little moisture left in it to protect it from being scorched. Tiemann[5] stated that, in drying timber, the actual temperature of the wood, while it is moist, is that of the wet bulb, provided there is sufficient circulation. In the investigations undertaken by the authors of Circular 619, it was not found that the fruits or vegetables were at the temperature of the wet bulb. At times when

considerable evaporation was occurring, the fruit being dried showed a temperature that ranged about midway between the temperature of the wet bulb and the temperature of the dry bulb of the hygrometer. After evaporation had perceptibly slowed down, the temperature of the fruit began to rise, and by the end of the drying period it had closely approached the dry-bulb temperature. Thus, the optimum drying period for apricots is considered to be 150°. After 7½ hours' drying in air at 175°, it was found that the fruit had become heated to 150°. The temperature of the drying air was then cut down to 150°, and the drying was finished after a total of 12 hours. Similar adjustment of temperature during drying should be made for each material dried. The drying time may possibly be further shortened by increasing the velocity of the air.

The Noel Dehydrator

The experimental Noel Dehydrator (as it may be called in view of the 1926 patent[4]) is 60 ft. long, 14 ft. high, and 4 ft. wide. Part of the length is taken up by space partly occupied by heaters and the fan. The rest is divided into six compartments of equal size, each of which can just receive one truck nearly 3 ft. long over-all and holding 30 trays in two tiers of 15. Each tray is 30 in. square and 3 in. deep. This gives a total effective spreading area of 1,125 sq. ft., and provides a loading capacity of 4,000 lb. of such heavy fruits as prunes, or about 750 lb. of ground oranges for marmalade, or 500 lb. of spinach, in the six compartments together. Each compartment is a complete drying chamber independent of the others, and may be used alone with all the others shut off, or in conjunction with the others. Steam-heated radiators warm the air. Air leaves the fan at the rate of 18,000 cu. ft. per minute, and is distributed by means of a short sheet-iron duct, vanes, and sluices to different layers of trays, passing from the top down and horizontally across the trays, then down through a port in the bottom into a return duct, by which it is returned to the radiators and thereby reheated the few degrees it has lost in one circuit. Three and one-third cu. ft. of air pass, theoretically, per minute over a strip of drying surface 1 in. wide and 30 in. long, thus coming into contact with only 30 sq. in. of material in one drying circuit.

Automatic Controls

Temperature control is effected by an indirect-acting duct thermostat of the intermediate or gradual-movement type. The design and mode of operation of this control are described in detail in the Circular. It maintains temperatures practically constant in all six drying compartments, within a range of 1° F.

The air is humidified and dehumidified by regulating a set of dampers, either by hand or by an automatic device. The drier is equipped with a hygrostat which regulates the amount of compressed air admitted to the damper motor. A high humidity saturates the wooden member of the hygrostat and deflates the motor diaphragm, opening the pair of dampers—one permitting the admission of fresh atmospheric air and the other permitting an equivalent amount of saturated air to exhaust to the atmosphere. When this exchange of air has reduced the amount of a moisture present in the mixture to the desired percentage of relative humidity, the hygrostat passes air to the motor diaphragm, inflating it; this closes the dampers and effects complete recirculation of air. The moisture given off by the material being dried may be the sole source of vapour for conditioning the air under this automatic control.

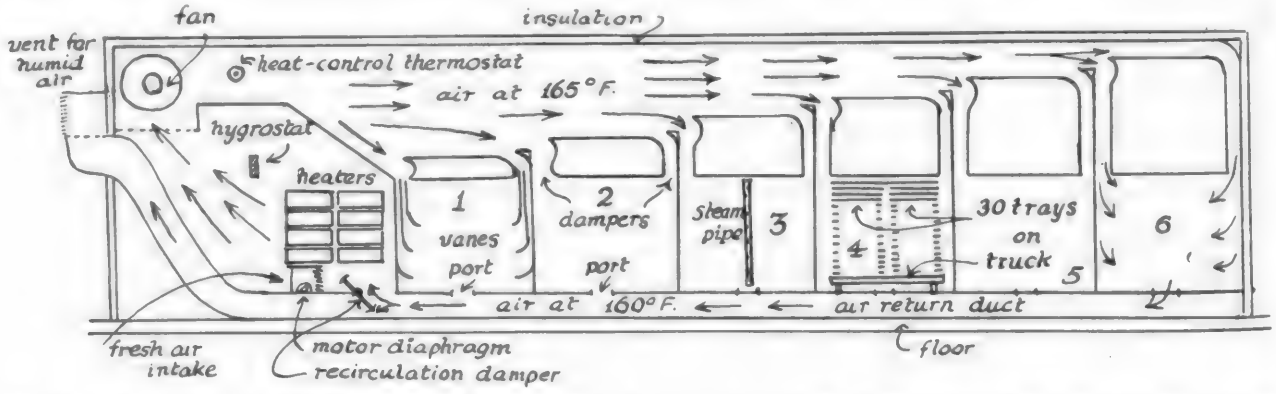
Blanching Without Rehandling

One feature in which this drier differs from any other is in its adaptability to the blanching operation so necessary in drying vegetables. Each compartment is equipped with perforated pipes which can discharge steam through small nozzles. There is a valve to control the supply of steam to each compartment. Products to be blanched are put into the compartment on the truck, the air valves at the top of the compartment are closed, as is also the port in the bottom of the compartment. The steam valve is then opened and the steam fills the compartments and thoroughly blanches the products. When the bottom port is opened, steam shut off and air admitted, vapour is quickly cleared from the compartment and drying begins. In this way spinach was dried in four hours after three minutes' blanching at 180° F. Blanching in the drier makes full use of the heat and moisture in the steam used for blanching. In addition to economies in heat, there is a saving of labour since one set of handling and loading operations is eliminated.

The moisture percentage of fruits containing much sugar should not exceed 15 to 20, while that of other fruits and vegetables should not exceed 5 to 10, the preference in both cases being for the lower figure. Methods recommended for the preparation (including blanching) and drying of the principal fruits and vegetables, together with data on waste and yield, are given in a two-page table. More detailed directions are given in six pages of text. Notes on curing (to ensure even distribution of moisture in pieces of different size) and on packaging are included.

SELECTED REFERENCES

1. *U.S. Dept. Agric. Circ.*, 619, Sept., 1941, pp. 46; Washington D.C. Supersedes *U.S. Dept. Agric. Bulletin*, 1335; "Commercial dehydration of fruits and vegetables".
2. Noel, W. A. "Drying by recirculation of air. Apparatus developed for food dehydration by the Department of Agriculture suggests improvement in general drying practice." *Chem. and Metall. Engng.* Vol. 33, 1926, 480-482.
3. Wiegand, E. H. "Recirculation driers." *Oreg. Agric. Expt. Sta. Circ.*, 40, 1923, pp. 11; revised 1929.
4. U.S. Pat. 1,594,549 of 1926: Method of and apparatus for drying and conditioning materials. *U.S. Pat. Off. Gaz.*, 349 (1), 113.
5. Tiemann, H. D. "The theory of drying and its application to the new humidity-regulated and recirculating dry kiln." *U.S. Dept. Agric. Bull.*, 509, 1917, pp. 28.



Sketch of the arrangement of the Noel Dehydrator after a diagram reproduced from *Chemical and Metallurgical Engineering* in U.S. Dept. Agric. Circular, No. 619. The exhaust damper is not shown; it immediately precedes the recirculating damper. Each of the six compartments is provided with all the features shown separately for the sake of clearness in Nos. 1-4.

THE STORAGE OF COAL

F. J. MATTHEWS, B.Sc.

WAR-TIME transport and production difficulties have already caused severe restrictions in fuel supplies, and such problems may be increased in the future as the nation's war effort gathers momentum. These conditions emphasise the need for building up stocks of coal to avoid interruptions of factory operation, particularly during severe weather conditions. The need for sustained production is imperative, and it is important to ensure that stoppages are not enforced by shortage of coal.

Deterioration of Coal

The procedure to adopt in storing coal, and in looking after the stock of coal until it is used, requires careful thought, since coal stocks may deteriorate seriously. In some instances, indeed, the coal has taken fire and hundreds of tons of fuel have been lost. This is a serious loss of fuel and the cost to the factory is increased by the expense of fire-fighting measures which have to be taken. At the present time, particularly, we should not lose sight of the fact that a burning coal dump may attract enemy attention at night, and even more serious consequences to the factory itself are then probable.

The basic cause of the self-heating of a pile of coal is the slow union of the fuel with oxygen in the air, and the important thing is to control various storage factors so that this rate of union does not accelerate to such a point that the heat developed is sufficient to ignite the fuel, as in the domestic grate. More than this, it is necessary to minimise the heating, since the value of the coal as a fuel is diminished progressively the further this self-heating develops.

Importance of Size of Coal

The character of the coal is an important factor influencing the tendency for spontaneous combustion. The size of the coal is important. Fine coal heats more rapidly than lump coal because more surface is presented to the air. The surface area of 1 solid ton of bituminous coal is 47 sq. ft., but in the form of 3 in. lumps the surface is 1,000 sq. ft. This increases to 15,000 sq. ft., for pieces only $\frac{1}{10}$ in. in size. In fact, it is known that the rate of heating increases with the surface area, especially when freshly broken and exposed, and decreases with time. Coal should, therefore, be handled in such a way as to cause the minimum breakage. Some coals heat more readily than others, since they contain more ulmins and other easily oxidised substances. This is why anthracite, low in easily oxidised constituents, can be stored without trouble. Iron pyrites or "brass" has often been blamed for causing spontaneous combustion, but the heat developed in the oxidation to sulphuric acid is not appreciable. More likely, the reaction helps to break up the coal and present more and fresh surface for oxidation. Moisture, too, will react with pyrites and tend to open the coal in such a way. Freshly mined coal is more liable to self-heat, and it is wise to allow such fuel to stand to weather for about a month before stacking it in a dump. It is also advisable not to mix two or more different coals in the same dump.

The Ventilation of Stored Coal

Adequate and uniform ventilation of stored coal is one of the most effective means of preventing firing. All stored coal will oxidise slowly to some extent, but the danger arises when the heat developed cannot be removed and therefore raises the temperature of the fuel. The hotter the coal the greater the rate of oxidation, and, eventually, rate of oxidation and self-heating is such that ignition takes place. This should be kept in mind in placing coal in storage and precautions taken to prevent segregation into different sizes. Pockets of fine coal present a large surface area of fuel for oxidation and therefore heat developments; firing is further favoured by the fact that fine coal offers a high resistance to the passage of air and dissipation of the heat by ventilating air currents does not take place. When coal is put in store by dropping it from a height above the dump, the larger lumps roll down the sloping sides, with the result that a dump is formed consisting of lumps at the base and fines above. Air can enter the base and oxidise the coal, but the blanket of fine prevents the escape of the heat, until spontaneous combustion takes place. This dangerous condition is illustrated by Fig. 1. It is clear that special care should be taken not to discharge into storage from a height, since this favours segregation of the foregoing character. The breakage into fines also creates fresh and readily oxidisable surfaces. The safer position when coal is carefully dumped in horizontal layers, so that it remains mixed with the fine coal filling the interstices, is shown in Fig. 2. Heating can also occur as a result of irregular admission of air to various parts of a pile, such as through drains, through porous bottoms such as coarse cinders or irregular brickwork, or around pole posts, gantry legs, girders, beams, etc.

Maximum Depth of Dumps

After the coal has been put into store, the coal pile should be watched, particularly after lying from six weeks to three months, when spontaneous combustion often occurs. The character of the coal, method of packing, etc., influence the depth at which maximum heating takes place. The danger point is often 5 to 7 ft. from the surface, where it is deep enough from the surface to prevent the escape of heat. But coals differ considerably; some will ignite in heaps of 5 ft. or less, while others can be stored over 10 ft. deep. Experience with a particular class of coal or coal from a particular district or mine is the best guide to maximum depth of dumps. It is well worth while, however, to have some system of watching how the coal is behaving in respect of spontaneous heating. On large dumps particularly, it is worth while to sink a number of temperature inspection pipes in the pile, fitted with distant reading thermocouples. Regular temperature observation, at various depths by lifting thermocouples, can then be made. Warning should be taken at a temperature of 130° F.; at 150° to 160° F., the coal should be spread out to cool, or, if possible, it should be used. At such temperatures the rate of oxidation is so rapid that the coal is in imminent danger of firing, and it will probably start to smoke at 180° F. or thereabout. A simpler method of ascertaining if heating is taking place is to push steel rods into the pile at various points. Withdrawal of these from time to time will enable one to find the extent of any hot spots by passing a hand along the rod. An estimate can also be made of the extent of heating by using a thermometer in a pipe pushed in at the point concerned. Any temperature inspection pipes should, of course, be kept with ends closed to prevent any irregular ventilation being set up, but if this caution is accepted it is a good plan to map out a coal dump into 10-ft. squares, with a 1-in. pipe for each section, for examination from time to time.

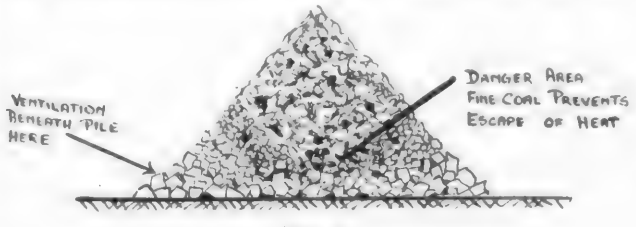


Fig. 1.

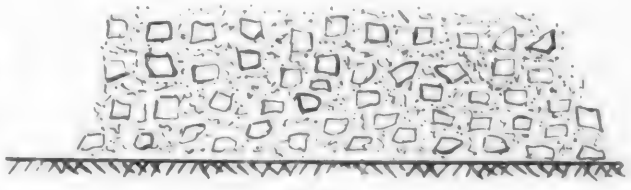


Fig. 2.

The Site of Coal Dumps

The site of the dump should be given some consideration. It should be dry, level, and free from drainage; there should be no drains which could admit air beneath the pile. The site should be cleared of vegetation, which will decay and eventually become readily oxidisable, and will thus help heat the stored coal. All other foreign matter and waste lying around should also be cleared away; this includes rags, paper, wood, tar, waste oil, sawdust, engine waste, etc. If possible, protect the dump from rain, which will increase weathering and expose more coal fresh surface for oxidation; ample ventilation over the surface of the dump must be allowed, though.

Storage should, if possible, be kept at a distance from buildings to avoid danger of spread of the fire if the store should ignite. It is also useful to have some room for spreading out coal to cool if it heats up. Furthermore, coal stored against buildings may receive heat from them, and even moderate heating of this character is undesirable. It is necessary to be prepared to deal quickly with fire. Particularly in the case of an unfamiliar coal, or a fuel known to fire easily, arrangements should be made to dig out " hot spots " and spread the coal to cool. A good supply of water is, of course, required, but since a wall of coke will sometimes build round the heart of the fire and obstruct further quenching, digging out is often essential. A practice sometimes adopted is to dig out in any case after 2 to 3 months, and spread the " dug-out " section to cool for a while. If the whole dump is worked over in this way, and then repiled, it is found that the restored coal shows much less tendency to self-heat. A safer coal stock is thus obtained, but there is a limit to the storage time, since the stored coal loses its heating value gradually, and should be used before the loss is serious.

TREATMENT OF SEWAGE AND TRADE EFFLUENTS

At a joint meeting of the Institution of Chemical Engineers and the Chemical Engineering Group of the Society of Chemical Industry, which was held on December 9, Dr. A. Parker, Acting Director of Water Pollution Research of the Department of Scientific and Industrial Research, described a new process of treatment of sewage and certain trade effluents, which has been developed as a result of experiments in the laboratory and on a very large scale by the Water Pollution Research Board over several years. This process, which is known as " alternating double filtration ", is a new method of operation of percolating filters to bring about biological purification of sewage and trade effluents and thus to reduce their polluting effect on any river or stream into which the liquids may be discharged.

Purifying Milk Effluents

Some years ago the Water Pollution Research Board were faced with the problem of devising a satisfactory method of purifying the polluting waste washing waters from milk collecting and distributing depots and from the manufacture of cheese, butter, and other milk products. Among the methods tried for purifying these waste waters was that of treatment by single filtration according to the process ordinarily employed for domestic sewage. Satisfactory purification was obtained for a time, but the quantity of solid matter, including growths of fungi and other organisms, which formed in the top layers of the filter soon clogged the filter. In experiments in the laboratories of the Birmingham Tame and Rea District Drainage Board it was discovered that excessive quantities of solid matter, which had accumulated in the top layer of the filter as a result of supplying the filter with milk effluents, could be removed and the filter again brought into a satisfactory condition if the filter were treated for a week or two with purified effluent from another filter. This observation led to laboratory experiments in which the milk effluents were passed first through one percolating filter and then through a second percolating filter. After the filters had been in operation for about two weeks the milk effluents were supplied during the next two weeks to the second filter and the treated liquid from this filter was passed through the first filter. The order of the two filters in series was changed at intervals throughout the experiment. The laboratory experiments showed that by this new process of alternating double filtration the difficulties previously caused in single filtration by excessive accumulation of solid matter were avoided. On the basis of these experiments a large experimental plant was installed at a cheese factory, where facilities were provided by United Dairies, Limited. This experimental plant was operated under various conditions for a period of three years, without any serious difficulty. Throughout this period final effluents of excellent quality were obtained. The quality of the treated effluent was so good that trout were able to live in it for long periods without suffering any harm. While these experiments on a large scale were in progress full-scale plants were erected at several milk depots and factories in this country, and these plants have been in satisfactory operation for several years.

THE FLAVOUR OF BUTTER

Whatever other features butter may possess, there is no doubt that flavour and aroma are its most important characteristics. When butter reaches the consumer, the flavour and aroma are the grand total of the natural flavour of fat as it is normally produced by the cow, plus the flavour of the ingredients added during manufacture, plus the odours and flavours absorbed during the handling and storage, plus the flavours caused by the activity of micro-organisms, and, lastly, the flavours which result from chemical changes in the product.

To satisfy the consumer, the butter manufacturer must retain and incorporate the flavour and aroma which are desirable, and prevent those which are undesirable. This is not a simple matter. Most of the materials causing flavours are very powerful, and, therefore, extremely minute amounts have a telling effect on the product. Furthermore, many of these active agents are formed after the butter is manufactured, and then there is little that can be done to remedy the situation. In this case an ounce of prevention is worth many pounds of cure.

If the cows are in normal health and properly fed they will produce a milk fat which has a very mild, pleasing flavour. The flavour of the butter made from this fat will be pleasing to many consumers, but others will criticise it as being flat and too bland. These consumers prefer a more intense flavour and aroma. Butter-makers have learned that they could build up a flavour in butter by ripening the cream. Just when this discovery was made is not known, but records show that as early as 1850 cream for churning was allowed to sour naturally in order to improve the flavour of the butter. In 1861 it was learned that dairymen in Holstein were adding buttermilk to cream in order to hasten the formation of acid.

Thus, the use of buttermilk or sour cream as a starter for ripening sweet cream became a general practice before anything was known about bacteriology. Many of the dairymaids of that time did not approve of the use of buttermilk as a starter, since they discovered that frequently this practice produced unfavourable results. This led to the use of sour milk prepared from a sweet milk and a certain proportion of warm water, which were mixed and set away until the mixture became sour, thick and smooth. This was called the " new sourer," and it was used as an inoculum for cream, and was considered superior to buttermilk. The introduction of the use of the thermometer in 1860 played an important part in the development of souring agents.

The use of these souring agents did not produce uniform results, and as early as 1878 a prize was offered by the Scandinavian Preserved Butter Company to encourage a " thorough investigation of the conditions which influence the souring of cream." Although a number of people investigated this subject, no satisfactory solution was found within the specified time of the contest.

In 1884, Storch, a Danish bacteriologist, started a bacteriological study of butter. In 1888 he produced his pure cultures of lactic acid bacteria and demonstrated that this culture could be used as a souring medium for pasteurised cream. Similar discoveries were also made independently and simultaneously by Conn in the United States and Weigeman in Germany.

This brief reference to the early history shows that from the very beginning of the commercial butter industry the control of the flavour of the product has been an important problem.

A number of scientists have made valuable contributions to the study of flavours in butter since the early works of Storch, Conn and Weigeman, but undoubtedly the next greater contribution along this line was the discovery in 1919 by Hammer and Bailey in the United States, Boekhout and de Vries in Holland, and Storch in Denmark, that two different types of bacteria were responsible for the desirable flavour in starters.

The work of these investigators pointed out the value of the fermentation of citrates in the development of flavour and aroma. Templeton and Sommer, Ruehe and Ramsey, and other investigators have shown that the intensity of flavour and aroma of starters can be increased by the addition of citric acid or sodium citrate to the milk used for starter making. This information has added to the stock of knowledge regarding flavour and aroma in butter.

About six years ago Niel, Kluyver and Derx published the results of their studies, which proved that diacetyl was the cause of the flavour and aroma in butter. Their results have been confirmed by other investigators, and thus another milestone was reached in this field of study.

On reviewing the investigations referred to, one is impressed with the progress and accomplishments of these scientists. They have gone far in determining the factors which are responsible for desirable flavour and aroma in butter. However, when this subject is considered from the standpoint of commercial manufacture, one is also impressed with the apparent lack of control of the flavour and aroma of the product. Some plants make excellent starters and obtain satisfactory results—others do not. Highly ripened cream produces highly flavoured butter, but this product will not keep satisfactorily. Some markets desire high flavour and aroma—others do not; hence, Dr. Ruehe says, there is need for a definite method of controlling flavour, and one that is simple and inexpensive to use.

In 1920, Ruehe and Stiritz studied the effect of distillation on the flavours in cream. When off-grade cream was subjected to distillation under a partial vacuum, both good and bad flavours were removed, and the cream so treated produced a butter having a very bland flavour. It was this work that prompted the attempt to remove the desirable flavour from starter in such a form that could be standardised and added to the butter.

The work with starter distillate has proceeded along the following lines:

(1) A study of various starters for the purpose of selecting a culture that would produce a relatively large amount of diacetyl.
(2) A study of methods of starter management so as to increase their flavour-producing ability.
(3) Standardising the flavour of butter.
(4) A study of the keeping quality of butter to which varying amounts of starter distillate have been added.
(5) A study of the economy of adding starter distillate to butter rather than adding starter to cream.

When adding starter to cream, extreme care is necessary in order to avoid the development of off flavours which may be transmitted to the butter. This fact practically limits the buttermaker to the use of a starter which has not been incubated more than 16 to 24 hours; for, although a high-acid 48-hour culture will contain an increased amount of diacetyl, it may also impart an acid or cheesy flavour to the butter. Furthermore, nothing can be added to a starter which is to be used in cream to stimulate the development or increase the yield of diacetyl, since this procedure may affect the flavour or wholesomeness of the butter. This does not hold true for starter distillates, and a starter may be permitted to ripen to its maximum production of diacetyl, and non-volatile oxidising agents may be used in order to increase the production of diacetyl. Furthermore, the distillation process produces a sterile product, and, therefore, eliminates the possibility of adding yeasts, mould and undesirable bacteria to butter by the addition of starter.

The process of producing starter distillate is simple. The starter is placed in a still which has steam and condenser connections. Live steam is directed into the starter and the starter is boiled. The vapour coming from the starter is condensed, and this forms the distillate. The acidity and the diacetyl of the distillate may be standardised in the laboratory, thus making it possible to control the amount of flavour added to the butter.

(*The Milk Messenger.*)

[F]

Fish Canning in Australia

(*Continued from page 29*)

flesh and removed the curd, but altered the appearance of the flesh to the detriment of the pack. The acetic acid pack had slight curd and a cloudy liquor, but was more palatable.

Tuna

The tuna were all canned according to the methods described by Roedel—*i.e.*, gutted, pre-cooked, the flesh broken out, cut, and packed. Cottonseed oil (1 to 2 fl. oz.) and salt (1 tablespoon) were added per ½-lb. can. The fish were retorted at about 240° F. for 75 minutes.

Much of the canning of this fish has been for trade samples, though experiments have been conducted to determine the optimum pre-cooking time and weight losses. The methods have been described in Fisheries Circular No. 2 of this Division.

The results give a fairly clear indication of the time required for pre-cooking fish of various weights. The optimum times are tabulated below:

Weight of Fish. (lb.)	*Pre-cooking Time.*		
	Fish Placed in Retort at Room Temperature.		*Fish Placed in Retort at 220° F.*
	Time Taken for Temperature to reach 220° F.	*Temperature Maintained at 220° F. for:*	*Temperature Maintained at 220° F. for:*
1-4	45-60 mins.	15-30 mins.	—
5-9	,, ,,	30-60 ,,	60 mins.
10-12	,, ,,	60-90 ,,	60 ,,
12-18	,, ,,	2-3 hrs.	3-4 hrs.
18-25	,, ,,	2-3 ,,	—

These figures are the results of tests on 83 fish, mostly of the 5 to 9 lb. class, but it is hoped to extend these observations and study further relationships between time of pre-cook, loss of weight, and flavour. The longer the pre-cook the greater is the loss of weight; hence the time of pre-cook must be as short as is consistent with tenderness and good flavour.

Judging the Packs

The results of the packs were assessed by a tasting panel composed of wives of officers and certain others, who were assumed to represent a cross section of the purchasing public. They were asked to report on vacuum, colour, texture, flavour of the fish in the can, the method of preparation for table, if any, and the flavour of the resulting dish. Marks were to be given for each of these, but the members of the panel found difficulty in assigning numerical values. It was found that in most reports agreement was close, and in cases where widely different opinions were recorded, the result was taken as being poorer than the most favourable report.

An entirely satisfactory method of recording results has yet to be found. If each pack is sampled separately, memories of finer flavours are lost, but if a large number of cans are tasted at once, the palate loses its sensitiveness.

British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

MINISTRY OF FOOD

LATEST STATUTORY RULES AND ORDERS

The list given below is the continuation of the list of Orders published in *Food Manufacture*, January 1, page 18.

No.	*Date.* 1941.	PRICE FIXATION ORDERS
1698	Oct. 29.	Amending the Home-Grown Wheat (Control and Prices) Order, 1941. (1d.)
1699	,, 29.	Amending the Home-Grown Tomatoes (Maximum Prices) Order, 1941. (1d.)
1700	,, 29.	General Licence under the Flour (Maximum Retail Prices) Order, 1941. (1d.)
1701	,, 29.	The Poultry (Maximum Prices) (No. 2) Order, 1941. (2d.)
1723	Nov. 3.	The Home-Grown Leeks (Maximum Prices) Order, 1941. (1d.)
1735	,, 4.	Marmalade (Maximum Prices) (No. 2) Order, 1941. (2d.)
1736	,, 4.	Jam (Maximum Prices) (No. 2) Order, 1941. (4d.)
1753	,, 6.	Amending the Butter (Maximum Prices) (No. 2) Order, 1940, and Directions under Regulation 60G of the Defence (General) Regulations, 1939. (1d.) [Reg. 55,60G.] (National Butter.)
1754	,, 6.	Prescribing Appointed Days in relation to Great Britain for the purposes of the Sugar Confectionery (Maximum Prices) Order, 1941, and the Chocolate and Chocolate Confectionery (Maximum Prices) Order, 1941 (1d.) [1941 Nos. 1435 and 1436.]
1765	,, 8.	Directions under the Oats (Control and Maximum Prices) Order, 1941. (1d.)
1791	,, 12.	Imported Canned Fish (Maximum Prices) Order, 1941. (2d.)
1792	,, 12.	General Licence under the Oats (Control and Maximum Prices) Order, 1941. (1d.)
1793	,, 12.	Amending the Barley (Control and Maximum Prices) Order, 1941, the Home-Grown Beans (Control and Maximum Prices) Order, 1941, the Home-Grown Rye (Control and Maximum Prices) Order, 1941, the Home-Grown Dredge Corn (Control and Maximum Prices) Order, 1941, the Oats (Control and Maximum Prices) (Northern Ireland) Order, 1941, and the Home-Grown Beans (Control and Maximum Prices) (Northern Ireland) Order, 1941. (1d.)
1794	,, 12.	Amending the Oats (Control and Maximum Prices) Order, 1941. (1d.)
1839	,, 18.	Amending the Home-Grown Tomatoes (Maximum Prices) Order, 1941. (1d.)
1851	,, 19.	Goat Meat (Maximum Prices) Order, 1941. (1d.)
1852	,, 19.	Pepper (Control and Maximum Prices) Order, 1941. (2d.)
1853	,, 19.	Milk Powder (Maximum Prices) Order, 1941. (1d.)
1862	,, 20.	Horseflesh (Control and Maximum Prices) Order, 1941. (1d.)
1872	,, 24.	Feeding Stuffs (Maximum Prices) Order, 1941. (7d.)
1889	,, 25.	Amending the Dripping (Maximum Prices) Order, 1941. (1d.)
1904	,, 26.	Amending the Fish (Maximum Prices) (No. 2) Order, 1941. (1d.)
1907	,, 26.	Amending the Poultry (Maximum Prices) (No. 2) Order, 1941. (1d.)
1908	,, 26.	Amending the Rabbits (Control and Maximum Prices) Order, 1941. (1d.)
		CANNED GOODS
1693	Oct. 28.	The Canned Goods (Prohibition of Retail Sales) Order, 1941. (1d.)
1744	Nov. 6.	Amending the Canned Goods (Prohibition of Retail Sales) Order, 1941. (1d.) (Beans.)
1824	,, 14.	Amending the Canned Goods (Prohibition of Retail Sales) Order, 1941. (1d.)

No.	*Date.* 1941.	CEREALS
1742	Nov. 5.	Starch Food Powders (Control) Order, 1941. (1d.)
		FEEDING STUFFS
1705	Oct. 30.	Directions under the Feeding Stuffs (Rationing) Order, 1941. (1d.)
1934	Dec. 1.	Order amending the Compound and Mixed Feeding Stuffs (Control) (No. 2) Order, 1940. (1d.)
		FISH
1755	Nov. 7.	Fish Sales (Charges) (Amendment) Order, 1941. (1d.)
1905	,, 26.	Wet Salted Fish (Licensing of Smokers) Order, 1941. (1d.)
1951	Dec. 3.	Amending the Imported Canned Fish (Maximum Prices) Order, 1941. (1d.)
		MEAT
1828	Nov. 15.	Amending the Bacon (Addition of Borax) Order, 1940. (1d.)
1871	,, 22.	Prescribing an Appointed Day for the Purposes of the Food (Restriction on Dealings) Order, 1941. (1d.) (Bacon.)
		MILK AND MILK PRODUCTS
1718	Nov. 1.	The Condensed Milk (American) Distribution Order, 1941. (1d.)
1731	,, 1.	Amending the Condensed Milk (Distribution) Order, 1941. (1d.)
1766	,, 8.	Amending the Milk (Size of Bottles) Order, 1941. (1d.)
1790	,, 11.	Prescribing Appointed Days for the Purposes of the Food (Restrictions on Dealings) Order, 1941. (1d.) (Cheese and National Butter.)
1809	,, 12.	General Licence under the Use of Milk (Restriction) Order, 1941. (1d.)
		POINTS RATIONING
1808	Nov. 12.	Food (Points Rationing) Order, 1941. (2d.)
1823	,, 14.	Amending the Food (Points Rationing) Order, 1941. (1d.)
1921	,, 28.	Directions under the Food (Points Rationing) Order, 1941. (1d.)
		VEGETABLES
1692	Oct. 28.	The Home-Grown Carrots (1941 Crop) (Control) Order, 1941. (1d.)
		GENERAL
1694	Oct. 28.	The Food Transport Order, 1941. (1d.)
1697	,, 29.	Amending the Food (Restrictions on Dealings) Order, 1941. (1d.)
1825	Nov. 14.	Amending the Directions, January 6, 1940, made under the Rationing Order, 1939, and amending the Tea (Rationing) Order, 1940. (1d.)
1887	,, 25.	Food Control Committees (Licensing of Establishments) Order, 1941. (1d.)
1888	,, 25.	Amending the Food Control Committees (Local Distribution) Order, 1939. (1d.)
1906	,, 26.	General Licence made under the Livestock (Sales) Order, 1940, and the Livestock (Restriction on Slaughtering) (No. 2) Order, 1940. (1d.)

NEWS FROM THE INDUSTRY

New Year Honours

Among the New Year Honours List figure the following:

K.C.B., Sir Henry L. French, Permanent Secretary, Ministry of Food.

K.B.E., William J. Rook, Director of Sugar, Ministry of Food.

O.B.E. (Civil Division), Miss S. Campbell, Assistant Divisional Food Officer for Enforcement, London, Ministry of Food.

* * *

Rubber Control Board

The Ministry of Supply announces that the constitution of the Rubber Control Board has now been completed. It consists of: Sir George Beharrell, Chairman; Mr. L. W. Farrow, Deputy-Chairman; Sir Walrond Sinclair, who will be particularly concerned with relations with the United States of America; Mr. J. F. Milne; Mr. R. S. Thompson; Mr. J. Bennett, and Mr. W. G. Essex.

* * *

Oat Products

The Ministry of Food announces that a General Licence has been issued under the Oat Products (Control and Maximum Prices) (No. 2) Order, 1941. The General Licence releases the following products from the maximum price provisions of the Order:

Oat flour manufactured and prepacked by the firms:

John Grant and Sons, Ltd., 7, Crichton Street, Dundee.

R. and A. Hannay, Ltd., Millers and Grain Merchants, Stranraer.

John Inglis and Sons, Ltd., The Midlothian Oatmeal Mills, Leith, Edinburgh, 6.

* * *

The Sugar Industry Bill

The Sugar Industry Bill, presented in the House of Commons by the Minister of Agriculture, Mr. R. S. Hudson, has for its main purpose the suspension for the duration of the war of the principal duties of the Minister and of the Sugar Commission under the Sugar Industry (Reorganisation) Act, 1936.

War-time control over the production, refining, sale and distribution of sugar is exercised by the Minister of Food, who will pay the British Sugar Corporation for sugar made from the 1940 beet crop and subsequent war crops.

The Bill provides that no assistance under the 1936 Act shall be paid to the corporation for sugar manufactured in 1940-41 and subsequent war years. Provision is also made for certain other adjustments of the principal Act consequent on war-time conditions, including certain retrospective adjustments to meet administrative difficulties in paying assistance to the corporation in respect of sugar manufactured from the 1939 crop.

The proposals will not entail any increased expenditure from public funds.

N.A.A.F.I. and Points Rationing

The Minister of Food has authorised N.A.A.F.I. to obtain home-produced tinned meats and tinned beans free of the points rationing scheme.

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Kosher Tinned Meat

From December 22, 1941, maximum wholesale and retail prices were in force for certain Kosher tinned meat products.

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Meat Products Containing Borax

The Minister of Food has made an Order amending the Bacon (Addition of Borax) Order, 1940.

Supplies of bacon were being received from the U.S.A., and this bacon under the American process of manufacture contained minute quantities of borax. Some of this bacon was released to meat manufacturers for processing. For a period until November 15, 1941, the Ministry of Food decided that manufacturers should be relieved of the obligation, imposed by the Bacon (Addition of Borax) Order, to label meat products containing borax. The amending Order gave effect to this decision.

* * *

National Wheatmeal Loaf

Sir Ernest Graham-Little recently asked the Parliamentary Secretary to the Ministry of Food to what proportion of the population the white loaf, fortified in accordance with the undertaking given in July, 1940, was now supplied; what proportion of the consumption of the national wheatmeal loaf now bore to the total consumption of bread in this country; what had been the expenditure to date by the Ministry in advertising the national wheatmeal loaf, and whether the Ministry had now abandoned or diminished such advertising.

Major G. Lloyd George replied: Figures relating to the proportion of the population to whom the fortified white loaf is now supplied are not available, but approximately 25 per cent. of the white bread and flour consumed in the United Kingdom is now being fortified with vitamin B_1. It is estimated that 7 per cent. of the bread consumed is in the form of the national wheatmeal loaf. The expenditure to date on advertising national wheatmeal is £29,000. The advertising has included many thousands of posters which are displayed in all parts of the country. The use of national wheatmeal bread and flour forms an important subject in the Ministry's food advice service to housewives. The Ministry has not abandoned this advertising but there is a wide range of subjects to be covered in the space available for the Ministry; consequently there are periods during which there is space for no more than occasional mention of wheatmeal in advertisements primarily devoted to other subjects.

Dr. H. D. Dakin, F.R.S.

The Council of the Royal Society has awarded the Davy Medal to Dr. Henry Drysdale Dakin, F.R.S., for his work as a pioneer in biochemical research and especially because of his fundamental contributions to the study of intermediate metabolisms.

* * *

Air Raid Precaution Booklet

Published by Glovers (Bristol), Ltd., is an excellent booklet with the above title. It is claimed that "if gas comes, everybody will know what to do. Half a second's reference will remove any doubt and save perhaps many lives".

The instructions given comprise the dealing with incendiary bombs, first aid, procedure after a gas attack, and the cleansing and care of gas masks.

A section deals with the names, method of recognition, description, effects of the more important gases and prescribes first-aid treatment. This section is reproduced by courtesy of British Timken, Ltd.

The booklet is intended for firms wishing to distribute them to their staffs, and by reason of its compactness and the clear nature of the instructions it should be invaluable.

* * *

Milk for Invalids

Under the Ministry of Food's milk-supply scheme priority supplies of liquid milk are allowed to certain invalids against a certificate given by a medical practitioner. The conditions qualifying for these special supplies are now specified in a list, drawn up by the Ministry's medical advisers and made public on December 11, 1941, as follows:

Active tuberculosis of all types;
Silicosis;
Affection of the mouth, throat or gullet or organic nervous disorder causing interference with swallowing;
Gastric, duodenal or anastomotic ulcer;
Illness characterised by high and prolonged fever;
Post-operative conditions after major operations;
Active workers, including domestic workers, during an illness which temporarily incapacitates them for work;
Sick children not attending school;
Dyspepsia due to conditions other than ulceration of the stomach or duodenum;
Colitis; Diabetes mellitus;
Thyrotoxicosis; Nephritis;
Hyperemesis gravidarum; chorea of pregnancy; acute yellow atrophy occurring during pregnancy; albuminuria of pregnancy; eclampsia; which are of sufficient severity to entail total confinement to bed.

These diseases and illnesses are the only conditions for which special supplies of milk to invalids may be authorised by a medical practitioner. The quantity of milk allowed is at the discretion of the doctor, subject to a scale prescribed by the Ministry of Food.

Florida Citrus Canners

Florida citrus canners are being queried by the Government regarding their facilities for processing citrus pulp for marmalade. Before the present war several citrus canners had built up a considerable volume of business with marmalade manufacturers in England.

* * *

Compressed Air Terms and Standards

A book issued by the British Compressed Air Society contains many features of interest to compressed air users, including articles on the selection of plant, care and maintenance of compressors and also the British Standard for the testing of air compressors and exhausters, reprinted by permission of the British Standards Institution.

* * *

The Training of a Chemist

The following advertisement appeared in a recent number of *The Canner*:

The Florida Citrus Commission, according to reports, is looking for a capable research manager with accent on the capable. Qualifications: thoroughly trained and experienced in research, good public speaker, able to speak several languages. *No serious objection to a Ph.D. degree from a first-class university.* The italics are ours.

* * *

Food Research Institute

A most useful booklet is to hand from the Food Research Institute, Stanford University, California. It gives a list of publications and contributions from 1941-42 embodied in Wheat Studies, Grain Economics Series, Fats and Oils Studies; also a list of miscellaneous books embodying the results of research in fields other than those covered by the series mentioned.

This is a very handy index of American research, mainly concerned with wheat.

* * *

Sealing Collapsible Tubes by Welding

A novel method of sealing collapsible tubes by welding has been introduced by Andersen and Bruun (British), Ltd.

The sealing may be performed on any existing tube-filling and sealing machine to which a special electric welding attachment has been fitted.

The principal feature of the new seal is complete air and liquid tightness, and, in addition, a considerable saving in metal is attained by obviating the folding of the tube end.

The normal folded seal of a collapsible tube has always constituted the weak point of this otherwise so useful type of container, and confined their use to a comparatively narrow range of products. With the new hermetic seal collapsible tubes will become useful for the packing of a wide range of products which had to be packed in soldered tins.

Spoutless tubes when hermetically sealed may thus be used for a wide range of food products, such as coffee extract, cream, pastes, etc.

A Modern Canteen

The very latest of modern equipment is installed in the new canteen opened recently at the works of The Brush Electrical Engineering Co., Ltd., by the chairman of the Company, Sir Ronald W. Matthews, J.P. The restaurant can accommodate more than 1,200 people at one sitting. It has a floor area of 120 by 150 feet; is finely illuminated by ceiling lights augmented by electricity, and is cheerfully decorated in sunshine colours. A stage with a frontage of 50 feet has been installed.

The kitchen is equipped with the latest design for cooking and preparation of food by gas, steam, electricity and solid fuel. It is possible to serve 1,000 meals in five to seven minutes.

Three large quick-spray fountains with hot and cold water, and electric hand-drying machines are installed in the large entrance room for the convenience of employees and visitors.

The arrangements were carried out by The Brush Company's Building Department in co-operation with the builders, Messrs. H. Hammond and Sons, and the kitchen equipment was installed by Richard Crittall and Co., Ltd.

* * *

The Newspapers of Production

Speaking at a lunch to celebrate the 21st anniversary of the incorporation of the business as a limited liability company, Mr. John Pascoe, Deputy Chairman of British Timken Limited, commenting upon technical journals said: "I would like to say how impressed I am by the way the technical press is doing its important war-time job amid difficult conditions of paper supply and man-power. The technical press is doing very real and vital service to industry. Its work is an essential part of the drive for higher production. It is an essential industry in itself.

They give us news of the latest results of research and the practical application of new production ideas. In articles we are able to read the views of experts, to talk with whom many an industrialist would willingly journey the length of this country. They abstract the essential points from overseas journals and save industry an immense amount of time and trouble in so doing. They act as an exchange of information on welfare and other works management problems which are always of great importance but are vital in our war production drive."

* * *

Mr. Percy Dalton's New Position

Mr. Percy Dalton, Managing Director of Stokes and Dalton, Ltd., Leeds, has just been appointed Chairman (Hon.) of the Rusks Section of the Bread Division of the Ministry of Food. It will be recalled that Mr. Dalton was President of the record-breaking War Weapons Week at his home town, Ilkley. He has recently generously contributed £500 towards the newspaper appeal on behalf of the Caldecott Community.

Mill Employee Broadcasts to Germany

Mr. J. Mitchell, a member of the staff of the Regent Flour Mills, Glasgow, belonging to the Scottish Co-operative Wholesale Society, recently gave a broadcast on the B.B.C.'s Overseas Programme. The broadcast was one of a series of propaganda talks to German workers, and took the form of a dialogue in German, the subject being the war effort in Scottish factories, and the working conditions of the men.

Mr. Mitchell, who is a fluent German speaker, described the contribution which the Co-operative mills were making to the war effort. The men were working long, arduous shifts, and they had even drastically rearranged holidays in order not to break the continuity of production.

The speaker laid special emphasis on the excellent relations between the directors of the Wholesale Society, the management, and the men. By means of frequent meetings the men have a real interest in the running of the mills, and the discussions which took place concerned improvement in general welfare conditions, and means of bettering the flour mills' already high level of production and efficiency.

Disputes and differences did arise, but these were settled in a common-sense manner. There was one thing, however, about which there was no dispute—all were unanimous—we simply must win this war!

* * *

Visible Ventilation

Under this heading an article in *Safety Engineering* (1941, **83** (1) 35), abstracted by *Industrial Accident Prevention Bulletin*, describes the use of titanium tetrachloride for making surveys of ventilation air-currents. Titanium tetrachloride is said to be a liquid which is kept for this purpose in a corked bottle. On the removal of the cork a very white vapour is given off from the surface of the liquid. A very little liquid produces a lot of "smoke." A spoonful of liquid would "fill a house," says the article, though it does not specify what size of spoon or what size of house.

For use, a bottle of liquid is carried round the works and uncorked at the desired points, *e.g.*, near surface grinders and spray booths. The "smoke" is said to have only a faint odour. Nothing whatever is said about the degree of toxicity, if any, of the vapour, but enquiries in this country indicate that the substance should be safe if used in this manner. If large quantities were spilt or the bottle broken, irritation of the throat might result.

* * *

Fortified Meat

A certain packer in the U.S.A. is marketing an "enriched" canned meat —a meat containing extra vitamin D. This product contains "1,000 U.S.P. units of vitamin D per pound—600 more than is required by the average person per day."

D. P. C. C. Isherwood

Dr. P. C. C. Isherwood, O.B.E., Ph.D., F.I.C., Managing Director of W. J. Bush and Co., Ltd., has been appointed Chairman and Managing Director of the Company and President of its associated Companies, W. J. Bush and Co., Inc., of New York, and W. J. Bush and Co. (Canada), Ltd., of Montreal.

* * *

Machinery, Plant and Appliances

New provisions affecting licensing are contained in the Machinery, Plant and Appliances (Control) Order, 1942 (S.R. & O. 1942, No. 1) issued by the Board of Trade.

The Order replaces the whole of the previous Machinery and Plant (Control) Orders and Machinery Plant and Appliances (Control) Orders, with the exception of the three General Licences (S.R. & O. 1941, Nos. 777, 1164 and 1392), and embodies certain amendments and additions.

The new provisions have the effect of subjecting to licence machinery and plant for dyeing made-up goods and of exempting from licence (*a*) machinery, plant and appliances supplied to a manufacturer of machinery or plant not included in the schedule to the Order and for use with any such machinery, plant and appliances made or in course of construction and (*b*) prime movers or electrical machinery or plant for driving machinery or plant for the supply of which a licence has been granted under the Orders and for which driving means is not already available.

Application forms for licences to acquire machinery, plant or appliances falling within the Schedule to the Order may be obtained from the Machinery Licences Division, Board of Trade, 1-6, Tavistock Square, London, W.C. 1.

* * *

West African Cocoa Profits

Mr. Peake, Under-Secretary for Home Affairs, replying to a question concerning the profits of £382,000 made by the Minstry of Food on its distribution of West African cocoa between October 1, 1940, and June 30, 1941, said:

"It is the intention of H.M. Government to make in due course an equivalent grant either to the West African cocoa producers, or, in agreement with the colonial Governments concerned, towards expenditure designed to be of benefit to those producers.

"That relates to the net result over the whole period for which this may operate and it would not be desirable to dispose separately of a profit made in any one individual year."

Mr. Sorenson: Are the colonies likely to receive anything from this transaction or will they get nothing at all?

Mr. Hall: An increased price to cocoa producers is already being paid this year. It will cost during the year between £600,000 and £700,000. If there is any loss on the transaction at the end of this year a proportion of the profits will be used for that purpose.

Dublin Bakery Experiments

In a report recently submitted to the Cork Corporation by Dr. J. C. Saunders, Medical Officer of Health, in which he discussed differences between wholemeal and what he termed reconstituted flour, he drew attention, in connection with the latter, to the work of Mr. S. Anthony, Principal of the Dublin Bakery School, in which he showed that the tendency to stale was largely due to the increased percentage of bran in the bread; suggested that the addition of gelatinised starch in some form would help to overcome that fault, and claimed that by adding a small proportion of mashed potato that difficulty could be surmounted and result in the production of a loaf which would keep moist for days.

* * *

Portugal's Sardine Exports

According to the *Jornal de Comércio* (Lisbon), Portugal exported 14,651 thousand kilograms (metric tons) of sardines to Great Britain in 1939, and 17,385 thousand kilograms to Great Britain in 1940. In 1939, 9,970 metric tons were sent to Germany, normally the largest customer after Britain, but no figure is given for 1940. The respective Italian figures are 519 and 254 tons. No figure is given for Poland and Danzig in 1940, but export to occupied countries was possible overland; thus to Belgium and Luxemburg 802 tons were sent in 1940, against 3,303 tons in 1939. Exports to Denmark also decreased considerably. French imports from Portugal in 1940 were 6,511 tons, against 3,022 tons in 1939. It is possible that part of this increased figure represents German consumption.

* * *

Washing Machine Peels Potatoes

An original idea for peeling potatoes economically for canning has been worked out by a metal worker and a repair man in the Manatee Canning Company at Plant City, Fla., U.S.A. In this case an ordinary home washing machine was hooked up to do the peeling job. It is reported working out well and may be of interest to other canners who cannot obtain needed equipment, suggests *The Canner*.

A sheet of metal with nail holes punched in it forms a grater. This lines the tub of the washer. Against this the potatoes are thrown by the beaters of the washing machine. The beaters have extension arms screwed on to them, lengthening them because potatoes are not quite as bulky as clothes. Adjustment of the length of the arms has to be made carefully to get a clean, wasteless job of peeling. The cost of rigging up the washing machine was low.

* * *

Village Green Grows Sugar Beet

The main village green of Cockfield (West Suffolk) had fallen into disuse, but was ploughed last year and its eight acres have now produced a crop of sugar beet which has returned nearly £300.

Mr. R. G. Harry

The new address of Mr. R. G. Harry (late of Cardiff) is 5, The Wiend, Bebbington, Port Sunlight, Cheshire.

* * *

Peek Frean's in the Far East

Mr. E. Watson has just returned from a four-year tour of the Far East, where his headquarters were at Singapore.

He was married on Saturday, December 20, at Lewisham to Miss Josephine Leonard.

* * *

Mr. Greville Richard Thursfield, M.I.Mech.E.

Mr. Thursfield has been appointed managing director of Sturtevant Engineering Co., Ltd., in succession to the late George Augustus Mower.

* * *

OBITUARY

Mr. George A. Mower

We regret to record the death in his 82nd year of Mr. George A. Mower, chairman of the Sturtevant Engineering Co., Ltd., Igranic Electric Co., Ltd., Bifurcated and Tubular Rivet Co., Ltd., and Crosby Valve and Engineering Co., Ltd.

Born in U.S.A. in 1860, Mr. Mower graduated at the Boston College of Technology, and first visited England in 1883 on behalf of the Crosby Valve Co. and the B.F. Sturtevant Co., both of Boston, U.S.A. In 1884 he took up his permanent residence in this country and founded the Sturtevant Engineering Co. and the Crosby Valve and Engineering Co. Some years later he acquired a controlling interest in the Bifurcated and Tubular Rivet Co., which he reorganised. In 1898 he took up the agency of the Cutler Hammer Co. of Milwaukee, and in 1913, in order to manufacture and further develop their patented control gear in this country, he founded the Igranic Electric Co. The prominent position occupied by these companies in their respective spheres bears witness to Mr. Mower's enterprise and organising ability.

Mr. Mower was a man of outstanding force of character, boundless energy and remarkable foresight. His hospitality, keen sense of humour and generosity will long be remembered by his large circle of friends. He was probably the oldest American resident in London, and had held prominent positions in connection with practically all the better-known American activities in this country.

Although retaining the chairmanship of his many companies, ill-health prevented him in recent years from taking his former active part in their administration, so that his death, which is regretted by all who knew and worked with him, will not affect the policy or activities of the companies with which his name will always be associated.

COMPANIES

Tate and Lyle, Ltd.

At the thirty-ninth annual ordinary meeting of Tate and Lyle, Ltd., Sir Charles F. Leonard Lyle, Bt., M.P. (the President), occupied the Chair. In his statement, which was circulated with the report and accounts and taken as read, he said:

The Ministry of Food have requested us to hold far larger stocks of sugar than has been our practice in the past. To enable us to do so we are, therefore, asking you to pass a resolution that the directors' powers under Article 50 of raising, borrowing, and securing moneys be extended from £8,600,000 (the equivalent of the nominal share capital of the company) to £12,000,000. We are also asking you in terms of Article 41 to pass a resolution converting the paid-up shares into stock.

The President then moved the adoption of the report and accounts for the fifty-two weeks ended September 27, 1941, and the approval of the dividends recommended in the report, including a final distribution of 10 per cent. on the Ordinary shares, making 13½ per cent. for the year.

Resolutions were passed increasing the borrowing powers of the board from £8,600,00 to £12,000,000, and converting the paid-up shares of the company into stock.

Special tribute was paid to the magnificent work done by the staff during the critical times which had been passed through.

* * *

Aerated Bread Company, Ltd.

In his annual statement to shareholders of this company, Lord Greenwood stressed the importance of conserving the company's resources, says *The Financial Times*. The considerable improvement in trading profits, notwithstanding the difficult conditions during the year, were considerably offset by higher taxation, war damage contribution and higher expenses. However, the company has improved its liquid position, and the bank loan was reduced during the year by £189,000. While the shareholders will regret the absence of an Ordinary dividend, there can be little doubt that the decision to keep something in hand to meet contingencies is well advised. As Lord Greenwood points out, the war is entering its fiercest stage, and no one knows what the next few months will bring. In addition, the company, in common with many others, is faced with a difficult supplies problem, as the decline in the stocks figure underlines.

* * *

Clyde Cold Storage

Clyde Cold Storage Company announces the payment of two years' arrears of dividend on the 6½ per cent. Preference shares to May 31, 1941. Issued Preference capital is £33,870.

Oxo Limited

The Twenty-ninth Annual General Meeting of Oxo Limited was held on December 30.

Mr. Kenneth M. Carlisle (chairman of the company) said in the course of his report: The outstanding feature of the past year's trading has been an insistent and increasing demand for Oxo cubes, due to further restrictions of meat supplies and the public recognition of the value, apart from its other virtues and uses, of this popular and economical means of giving beefiness to dishes prepared with such foodstuffs as are available. In spite of our efforts to produce the maximum output from available plant, it has been impossible wholly to satisfy public demand. The deficiency in supplies has been made up to some extent with fluid Oxo. We have also produced additional supplies of Lemco, which is the form in which meat extract was originally offered to the public by Oxo's parent company nearly 80 years ago. We find that in present circumstances many housewives purchase this concentrated extract very readily and show appreciation of its economy in use, in spite of higher first cost.

We have continued to cultivate our trade in shredded suet and home-produced canned soups and meat and fish pastes, the greater part being sold under our well-known "Fray Bentos" brand. Every effort is made to produce goods of the highest quality, and the public have shown in no uncertain manner their appreciation of the high standard which we have been able to maintain.

The report and accounts were unanimously adopted and the formal business was duly transacted.

* * *

New Canned Beans Company

The Ministry of Food has power to appoint two directors to the Board of Candisco, Ltd., which was registered on December 16 as a company limited by guarantee, without share capital. Each member is liable for not more than £100 in the event of winding-up. The object is to establish an organisation for the importation, sale and distribution of canned beans.

The directors (to number not more than eleven) may be appointed as follows: Two by the Minister of Food, three by H. J. Heinz Co., one by Poulton and Noel, one by Crosse and Blackwell, one by the Co-operative Wholesale Society, and two by the Fruit and Vegetable Canners' Association.

The first directors are: The representatives of the Ministry of Food (not named), Messrs. A. H. Hughes (chairman), J. M. Harrison and J. E. Hutchinson (representing H. J. Heinz Co.), A. B. P. Roberts (representing Poulton and Noel), Wm. C. Campbell (representing Crosse and Blackwell), L. Cooke (representing the Co-operative Wholesale Society), Ella H. Gasking and Fred Hirst (representing the other members), R. P. Spink (chief executive officer).

Lever Bros. New Chairman

The directors of Lever Brothers and Unilever Limited announce that Mr. Geoffrey Heyworth, vice-chairman, has been elected chairman in succession to the late Sir Francis D'Arcy Cooper, and that Mr. Paul Rykens and Mr. Herbert Davis have been elected joint vice-chairmen.

Mr. Heyworth is 47 years of age, and has spent the whole of his business life with the company, since July, 1931, as a director, since the spring of last year as vice-chairman.

Mr. Rykens was joint chairman of Lever Brothers and Unilever N.V. at the outbreak of the war, when all directors of the Dutch company who were resident in Great Britain resigned their appointments with that company. Mr. Herbert Davis remains seconded for duty with the Ministry of Food.

Mr. Arthur Godfrey Short has been appointed a member of the board. Mr. Charles Edmund Tatlow has relinquished office as an advisory director.

* * *

Aluminium Information Bureau

The Aluminium Information Bureau has removed to new premises at 109, Jermyn Street, London, S.W.1 (Telephone: Whitehall 5411).

The Technical and Advisory Services of the Bureau will, as hitherto, be available to deal with problems submitted concerning the working, treatment and application of aluminium and its alloys.

* * *

Eggs and Bacon from Canada

Some details are available of the bulk supplies of eggs, bacon, ham, cheese, and evaporated milk which Canada is sending to Britain, in addition to large cargoes of wheat and smaller quantities of tinned fish and fruits (reports *The Times*).

Between now and the end of May the Dominion expects to send us 770,000 boxes of eggs, each containing 30 dozen, which, added to the 230,000 boxes already received since last summer, will make more than 30,000,000 dozen eggs for the year.

Before the war Canada used to export to Britain about 160,000,000 lb. of bacon and ham, but in the first year of the war this figure rose to about 330,000,000 lb., in the second year to 425,000,000 lb., and in the present exporting year the total is expected to reach 600,000,000 lb. About 7,000 tons of other pork products, including spiced ham and pork loaf in large tins, are also expected to arrive before next November.

In the contract year ending in March Canada expects to complete the shipment of 112,000,000 lb. of cheese, compared with 67,000,000 lb. in the year before the war. Evaporated milk shipments in the past two years have averaged a total of 700,000 cases, each containing 48 1-lb. tins.

Smaller shipments in recent months include fresh, tinned and dried apples, tinned tomatoes, a small supply of onions, and some frozen salmon.

INFORMATION AND ADVICE

Beef Extract—Rhubarb and Gooseberry Pulp—Information Supplied —Information Required

Beef Extract

7,494. *We have some 56-lb. tins of No. 1 South American beef extract and are considering diluting it and packing it in smaller packages. Can you give us any assistance as to recipe and method?* (Manchester.)

You do not make it clear what sort of a product you wish to make, and in what packaging. The matter also depends very much upon the quantity of extract which you have on hand whether it would be worth while acquiring the necessary plant for handling it.

The preparation of the raw product is a specialised business, and we suggest that you obtain the help of an expert.

Rhubarb and Gooseberry Pulp

7,421. *Can you please let us have a detailed method of making rhubarb and gooseberry pulp?* (Stockton-on-Tees.)

We gave a recipe some time ago in FOOD MANUFACTURE and we suggest that you might try this. It was as follows: "We understand that most pulp packers wash the fruit prior to pulping, and this is usually done by putting the fruit into tanks or casks of clean cold water containing about 100 parts per million of SO_2, then removing by a woven wire sieve and draining. The washed fruit is then put into a 40-gal. cask in which ½ gal. of 6 per cent. sulphurous acid and 2 gal. of water have been previously put. When 300 lb. of fruit have been added, a further ½ gal. of 6 per cent. sulphurous acid is added, and the cask filled up with water. After well sousing it is headed up in the usual way." With reference to the casks, we are advised that it is better to use waxed casks, although there is quite a large proportion of fruit pulp packed in unwaxed casks, both in this country and on the Continent. The method of waxing is to take a clean barrel and place it with the bung hole over a jet of dry steam. After steaming for 15 minutes or so the cask is removed and about 2 lb. of melted paraffin wax is poured in. The bung is replaced and the cask rolled and shaken. This distributes the wax over the surface, which, being hot, spreads evenly. Particular care should be taken to use dry steam and to put the paraffin wax in a few minutes after removing the steam jet, whilst the cask is still hot.

Information Supplied

7,358. *We require one dough mixer, two or three sack capacity, with two Z blades; any well-known make like Morton, Baker Perkins, etc., would do. A reconditioned machine which would not entail the trouble of getting a licence would suit. Can you put us in touch with anyone able to supply?* (Belfast.)

Names of second-hand plant suppliers were given.

7,361. *We shall be pleased if you will kindly supply us with the names and addresses of firms, from whom we may purchase India gum karaya, and also citric acid powder.* (Huddersfield.)

Names were suggested.

7,363. *We are requiring an homogeniser suitable for small testing samples larger than the household creaming machine, but small enough to be placed on an analytical bench, motor driven. Would you kindly supply us with the names of makers of such a machine?* (Leeds.)

The names of possible suppliers were given.

7,373. *If you can give me any information on how to invert sugars in the making of fondant, without glucose (we cannot obtain it), I should be very much obliged.* (Dublin.)

We suggest that you refer to the article, "The Inversion of Sucrose", by Eric Humphriss, A.I.C., F.R.M.S., which appeared in a previous issue of FOOD MANUFACTURE.

7,380. *Can you put us into touch with a firm in London or near Watford, willing and able to undertake a small grinding job for us? We need a 6-inch diameter steel plate reduced in thickness by 3/32 in. Any help will be appreciated.* (Watford.)

This was done.

7,383. *We are contemplating the tinning of rabbits for export, and would be much obliged if you could give us the name of any book written on the canning of meat of all descriptions. We want to find out the proper way to do this and would be very much obliged to hear from you.* (Cork.)

The canning of rabbits follows approximately the general methods of flesh food canning, and we should suggest that you get into touch with an expert on this subject as every proposition has to be treated on its own merits. Some books were recommended.

7,390. *We have an enquiry for a patent food moulding machine for a material of the consistency of brawn to cut the mould in about the size of half a bar of Sunlight Soap. Could you give us the names of various firms who make such machines?* (Liverpool.)

Names were given.

7,401. *Can you contact us with suppliers of beef extract suitable for the preparation of gravy?* (Antrim.)

Contact made.

7,404. *Could you let us know the manufacturers of yolk of egg yellow powder, in order that we may place an enquiry for, say, 56 lbs.?* (London.)

Names were given.

7,407. *We shall be obliged if you will put us in touch with the manufacturers of dried carrots.* (Glasgow.)

At the time of replying this commodity was not obtainable, but we understand that, later on, supplies may be available.

7,410. *We require a machine for cutting dates, but have not been able to trace manufacturers of such a machine.* (Ashton-under-Lyne.)

Names were given.

7,417. *We shall be glad if you could give us any information on the manufacture of glucose from potatoes. We should like to know what machinery is necessary and what chemicals or ferments are generally used for this purpose.* (Devon.)

The manufacture of glucose from potatoes is a very complicated one and one which would be too long to be covered by this information service. You will find a very good section on the subject in a recent book, "Starch and Its Derivatives", by J. A. Radley, M.Sc., A.I.C.

7,418. *We have received an enquiry for a machine to dice vegetable crops such as carrots, etc., having a capacity for one to two tons per hour, the size of the cube to be ¼ in. We are unable to submit a machine for their requirements and have replied to the effect that you may possibly have on your files the name of some manufacturers, and we should be obliged if you would forward these to our friends.* (London.)

Names of some manufacturers were given.

Information Required

7,055. *I should be grateful if you could let me know where I could get expert advice on the subject of the exploitation of spa waters.* (Belfast.)

7,958. *We require to extract the juice from wholesale linseed. Is it possible for you to advise the best method as we are having difficulty in sieving?* (Belfast.)

RECENT PATENTS

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

A Latex Compound to be Used in Connection with the Preservation of Certain Foods and Method of Making and Applying the same

This invention relates to an airtight covering for the preservation of articles of food, particularly hams, bacon and cheese, and/or for packages containing foodstuffs, and to a method of making and applying same.

An airtight covering, according to this invention, consists of a film or coating of a compound comprising caoutchouc latex mixed with shellac that has first been dissolved in a heated solution of ammonia. The invention also includes a method of making and applying such an airtight covering. This method comprises the steps of dissolving shellac in a heated solution of ammonia, allowing the shellac solution to cool to atmospheric temperature, then adding said solution to the caoutchouc latex, applying the compound thus formed in the cold state to the articles of food or to the food packages, and allowing the film or coating to dry.

The coating material is applied in the cold state in varying degrees of viscosity, according to the thickness of the coating required; that is to say, if a thin coating is required, the solution will not be so thick or viscous as will be the case when a film or coating of greater thickness is required.

The compound made according to this invention forms a homogeneous mixture which does not taint foodstuffs even when brought into direct contact with them, and the mixture is practically devoid of odour. These qualities of the mixture render it particularly useful for the formation of airtight coverings or films for the preservation of foods. The drying will not usually take more than 48 hours, though it may often be desirable to store the ham or cheese for much longer periods than is required merely for drying out; for example, the hams may have been recently cured, or the cheese may have been newly made and require maturing. In the latter case, the cheese may be dipped and left for any period required for it to mature, and when so treated it is unnecessary for the cheese to be turned daily according to present-day methods. In a large number of tests carried out it has been found that when a ham, cheese or other article is dipped in the mixture it will enter every crevice on the exterior surface and thus form a complete casing, which, when dry, will form a tight-fitting elastic covering which is impervious to usual atmospheric conditions and changes, and which conforms to every detail of the shape or formation of the ham, cheese or other article dipped, and whilst it adheres to the ham in this tight-fitting manner it can be cut and peeled completely and cleanly from the ham, leaving the surface or skin thereof unimpaired.

The mixture may be made in many colours by the addition of colouring matter, and it may also be made semi-transparent.

As long as the mixture remains in a liquid or viscous state the viscosity may be reduced by the addition of water, but no exact formula can be stated, as the quantity of water required will vary according to the mixture, the state of viscosity or fluidity of the compound at the time and also the extent (degree of density) to which it is desired to reduce the viscosity. This may, however, be determined empirically in any case where such action becomes necessary.

In the preparation of the compound according to this invention a solution of ammonia is added to water, and the shellac is then dissolved in the resultant solution. It is, however, essential that the water be heated and that the solution of ammonia of the specified strength be added to the water whilst the latter is at a temperature of from 100° F. to 212° F., according to the rapidity of solution desired, and that the shellac be added to that heated solution and stirred until thoroughly dissolved; and whilst it is not essential that the mixture thus formed should be brought to boiling point, it is preferable that it be kept at or about that temperature whilst the shellac is being mixed into it, because it reduces the time necessary for the shellac to become thoroughly dissolved.

To produce the latex compound according to this invention, caoutchouc latex of any grade can be used—for example only, a grade known commercially as 60/40 caoutchouc latex may be used, the shellac solution being first allowed to cool to ordinary atmospheric temperature and then added to the caoutchouc latex.

537,982. Leslie William Harold Shearsby.

Latest Patent Applications

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.

10289. Bellis, F.: Attachments to mincing machines.
10336. Brown Tractors, Ltd., D., Merritt, H. E., and Hull, C. H.: Means for connecting agricultural implements to tractors.
10380. Archer, D. T., and National Ice and Cold Storage Co., Ltd.: Method and means for shelling eggs.
10404. Bohner, E., and McElroy, W.: Machines for sealing containers.
10423. Brown Tractors, Ltd., D., and Merritt, H. E.: Means for controlling the depth of penetration, etc., of the tools of agricultural implements.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

539,335. Micro-Westco, Inc.: Slicing of articles such as bread loaves.
539,351. Wright, R. G., and Evans, Sons, Lescher and Webb, Ltd.: Hand-operable powder-spraying devices or appliances.
539,381. Falticzek, F. S.: Preparations for use in removing the repellent odours developed by fish foods in the process of cooking.
539,397. Vitamol, Inc., and Golodetz, A.: Vitamin compositions for use in feeding poultry and livestock, and methods of making the same.
539,401. British Thomson-Houston Co., Ltd.: Refrigerating apparatus.
539,464. King, A., and Sizer, A. W.: Grinding or pulverising devices.
539,522. Gibbs, S. T., and Baker Perkins, Ltd.: Apparatus for the spray treatment of biscuits and like articles.
539,527. British Thomson-Houston Co., Ltd.: Refrigerating apparatus.
539,546. Schwitter, A., and Bruder, K.: Cardboard can and tool for sealing same.
539,599. Creamery Package Manufacturing Co.: Machines for capping bottles or the like.
539,600. Robertson, J. H.: Heating apparatus for liquids or semi-solids.
539,612. Thomson and Norris Manufacturing Co., Ltd., and Prideaux, G. E.: Packing-cases.

TRADE MARKS

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

AVITA.—615,158. Biscuits, bread and foods made from cereals; all for human consumption. **Reginald John Springett,** 6, Quebec Road, Ilford, Essex; Baker and Confectioner.
KLIM.—615,200. Powdered milk. **The Borden Company,** 350, Madison Avenue, City and State of New York, United States of America; Manufacturers. Address for service is: C/o Stevens, Langner, Parry and Rollinson, 5 to 9, Quality Court, Chancery Lane, London, W.C. 2; Associated with No. 395,735 (2176) xlii.
MASGLO.—615,283. Jellies (for food). **The Scottish Flavour and Colour Co., Ltd.,** 27, Ratcliffe Terrace, Edinburgh; Manufacturers.

NEW COMPANIES

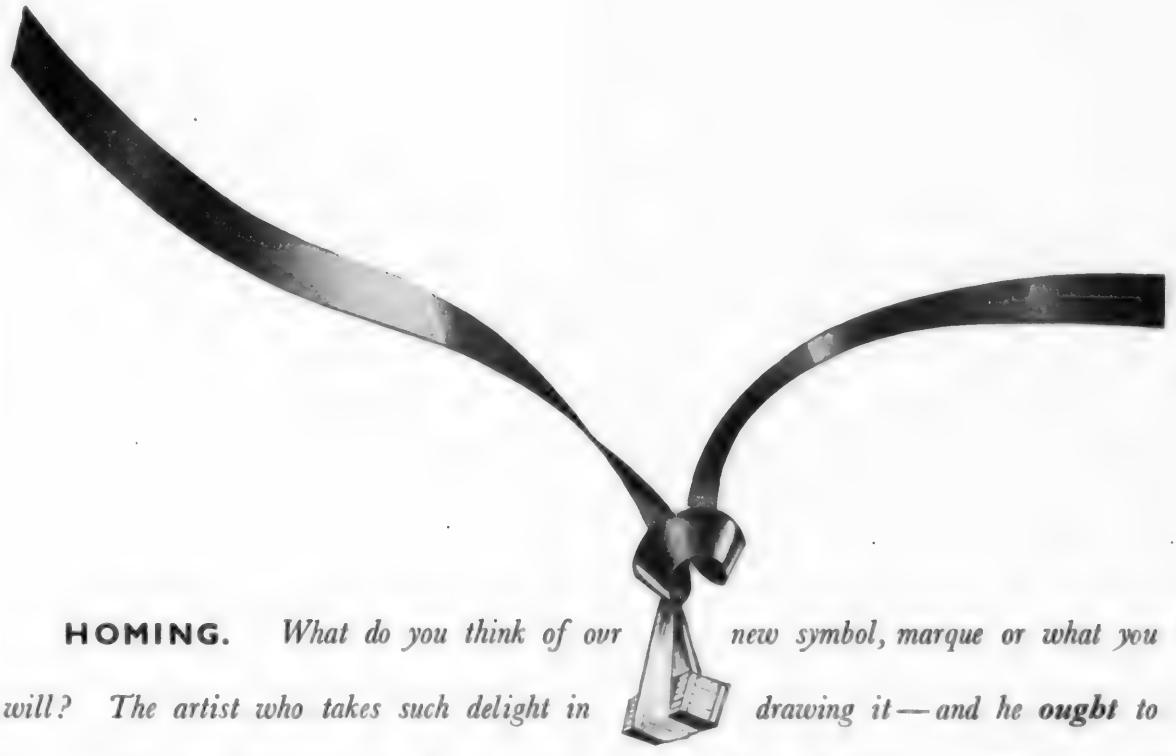
Osogood Limited. (365278.) To carry on the bus. of mnfrs. and packers of yeast and other extracts, etc. Nom. cap.: £1,000 in £1 shs. Dirs.: Not named. Subs.: E. M. Dodd, 33, Woodburn Boulevard, Bebington, Cheshire (acct.); W. F. A. Bland, 3, Woodville Avenue, Crosby, Liverpool, 23 (acct.).

W. E. Pearson and Sons, Limited. (366426.) To carry on the bus. of produce dlrs., etc. Nom. cap.: £10,000 in £1 shares. Dirs.: W. E. Pearson, 5, Tawny Street, Boston, Lincs.; W. E. Pearson, jnr., The Grange, Freiston, Boston, Lincs.; Walter Pearson, A. Pearson and J. Pearson, addresses not stated.

D. S. Petty, Limited. (366358.) To take over the bus. of a butter mnfr., produce mcht., etc., cd. on by D. S. Petty at 178A, Tower Bridge Road, Bermondsey. Nom. cap.: £9,000 in £1 shares. Mang. dir.: D. S. Petty, "Thorncroft," Littlehampton, Sussex. Sub.: D. M. Petty, 6, Farley Road, Selsdon, S. Croydon, Surrey.

Fred Robinson (Barnsley), Limited. (366415.) 7, Pitt Street, Barnsley. To carry on the bus. of mnfrs. of and dlrs. in confectionery, sweets, preserves, etc. Nom. cap.: £2,000 in £1 shares. Dlrs.: Beatrice Robinson, 26, St. John's Road, Barnsley; Sanderson, 190, Dodworth Road, Barnsley.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.



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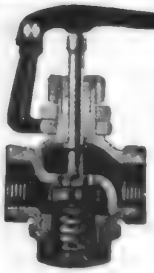

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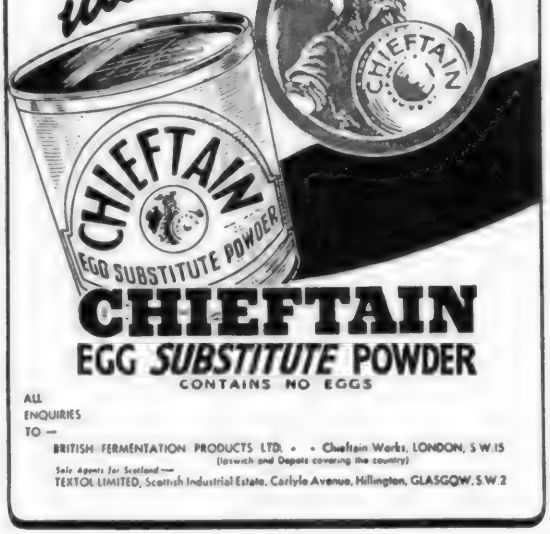

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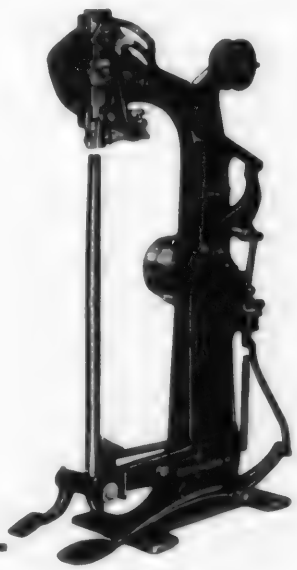

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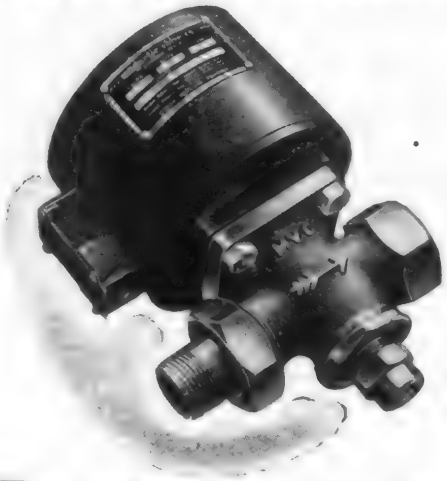

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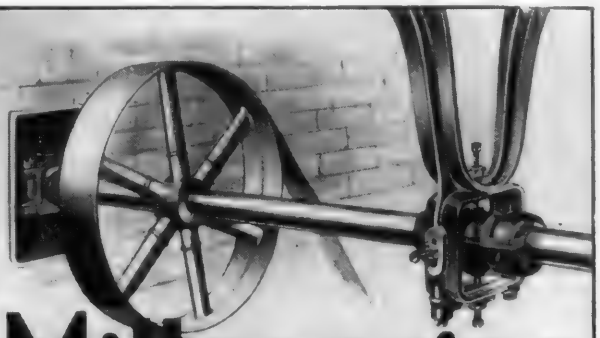

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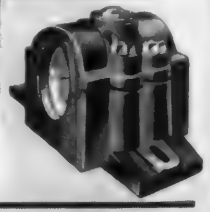

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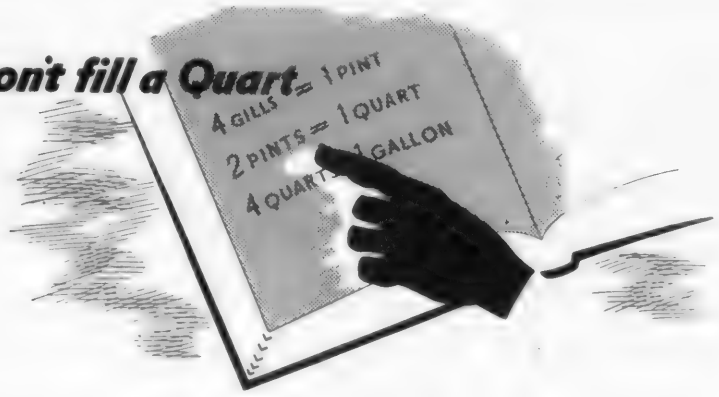

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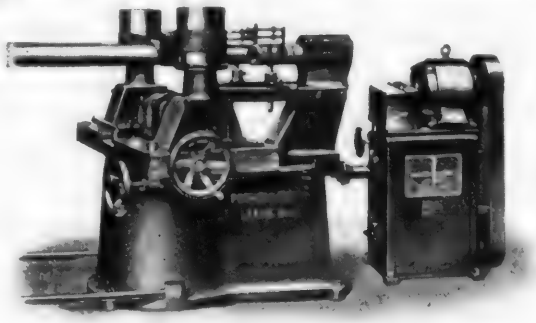

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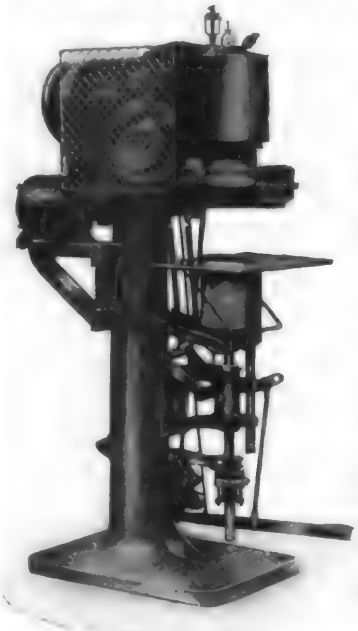

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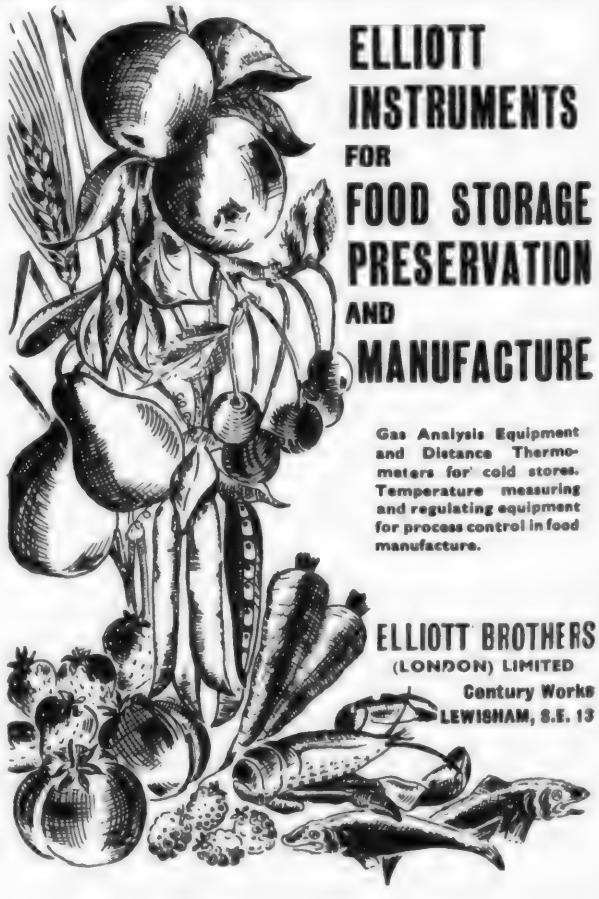

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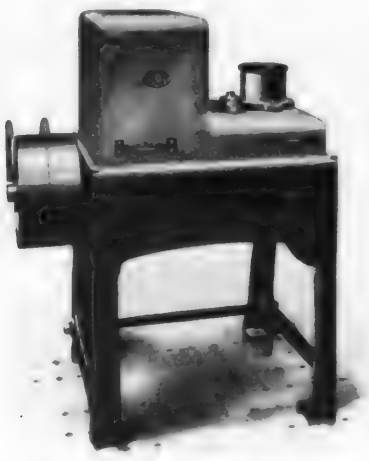

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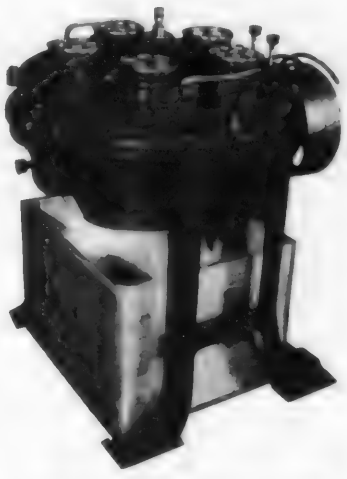

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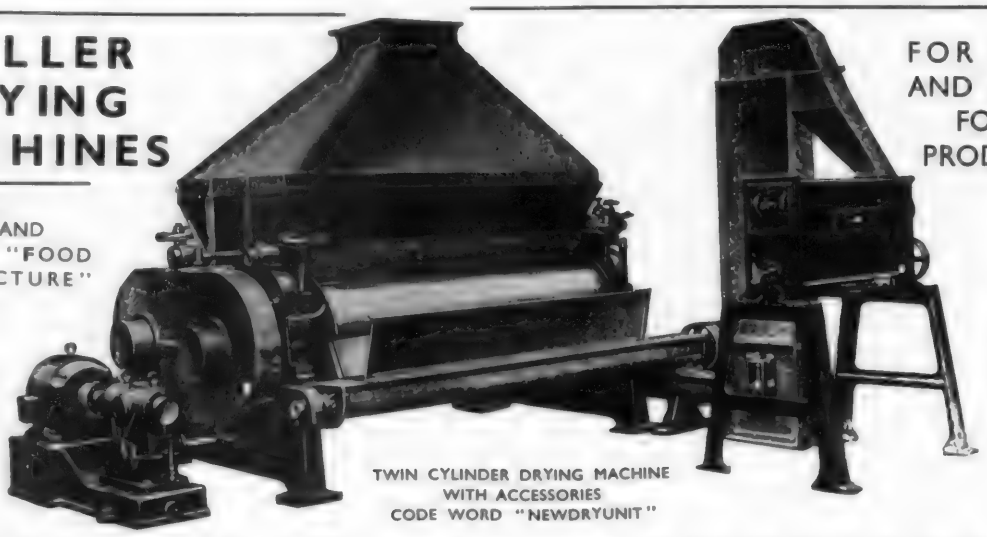

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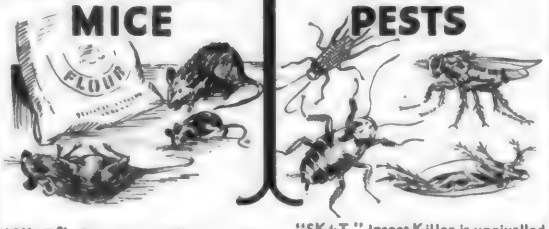

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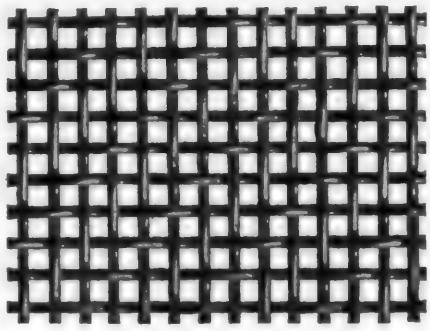

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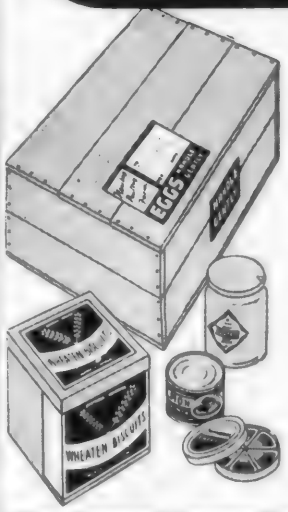

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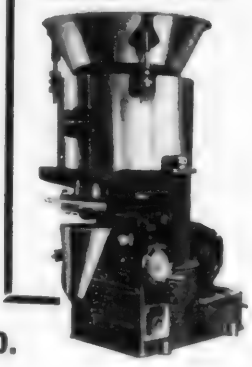

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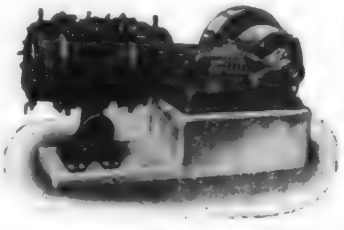

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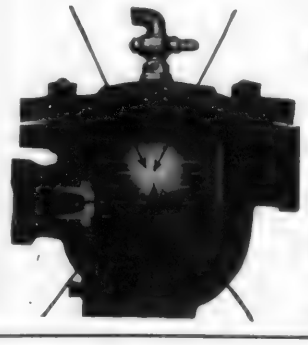

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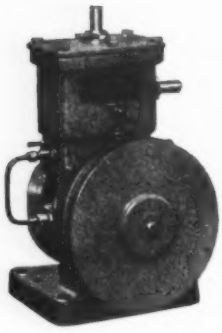

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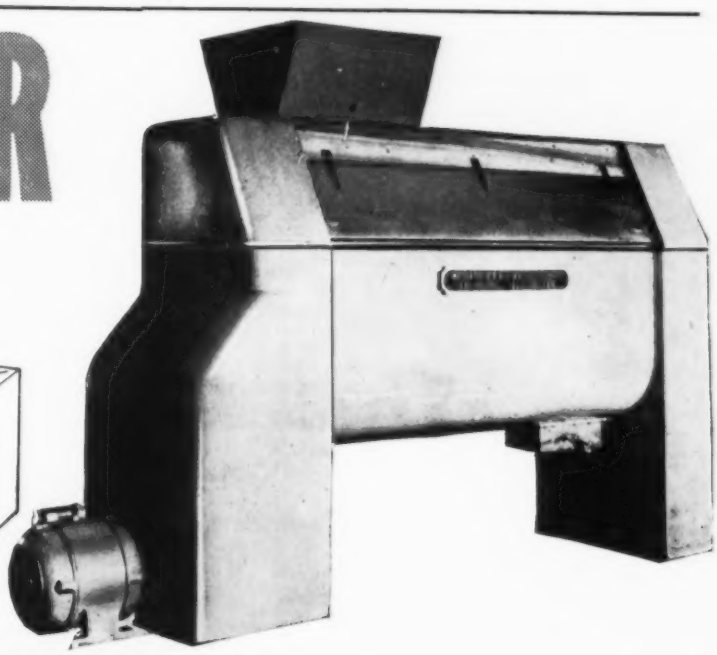

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